TreeBaltimore

Doubling Baltimore's tree canopy one tree at a time.

Urban Forest Management Plan

DRAFT

We want your comments!

Here's how:

1. Download the plan at: http://www.ci.baltimore.md.us/government/recnparks/treeBaltimore.html or call the TreeBaltimore coordinator for a copy (contact information below);
2. E-mail, phone, or mail your comments to the TreeBaltimore coordinator;
3. Send your e-mail address to receive notice about (2) community meetings in May and a Planning Commission hearing.

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Public comment period ends

May 31, 2007

City of Baltimore
Recreation & Parks

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Baltimore City Arbor Day
April 27, 2007

Sheila Dixon, Mayor

City of Baltimore
Recreation & Parks

Connie Brown, Director
Christopher Carroll, Chief of Parks
Rebecca Feldberg, City Arborist

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April 27, 2007

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"Our towns and cities have to remain livable. They can't just be concentrated with emissions and waste products. We need trees to help clean the water, clean the air, and to keep these places environmentally viable."

Mike Galvin
Maryland Department of Natural Resources

Introduction

Baltimore City's Urban Forest Management Plan is an investment in the city's future. Imagine a city with cool shaded streets and sidewalks, clean streams flowing to a clean harbor, beautiful stands of mixed-aged trees teaming with songbirds. Imagine a summer day when residents stay cool under the shade of majestic oak trees, without the persistent hum of air conditioners and a city where children breathe clean air. A sustainable urban forest plays an important role in making that vision a reality.

The Urban Forest Management Plan is a guidance document for city agencies, including the Departments of Recreation and Parks, Public Works, Transportation, and the Department of Planning and is part of Baltimore City's Comprehensive Plan. The plan includes recommendations on methods to increase and sustain the urban forest. Civic partners can also find useful information about Baltimore's trees and ideas on how to work in partnership towards the common goal of enhancing the urban forest.

For centuries, the trees and forests of Baltimore have helped to define the city's character and enhance its livability. Visitors of the 18th and 19th century enjoyed the natural forests as well as the "streets ornamented with trees". Thousands of trees were planted in the 19th century during the formation of the early parks system. In the early 20th century, community advocacy for street trees was strong, resulting in the Tree Ordinance of 1912. Shortly thereafter the City established the Baltimore City Forestry Division[1,2].

Now, nearly 100 years later, there is an urban forestry movement at the national, state, and local level that promotes comprehensive and proactive forest management as compared to the more traditional practice of reactive tree care.[3] Policy-makers increasingly recognize the economic and environmental values of trees. Healthy forests filter water, remove air pollution, and provide homes for wildlife. Trees remove carbon from the atmosphere that contributes to global warming and also reduce energy expenditures to cool the urban heart island.

What is a Sustainable Urban Forest?

Traditionally, the urban forest was considered trees within the public domain such as street trees and trees in parks. The profession of urban forestry has changed dramatically in recent years and so has the definition of the urban forest. For purposes of this Plan, a sustainable urban forest is "the naturally occurring and planted trees in cities which are managed to provide the inhabitants with a continuing level of economic, social, environmental, and ecological benefits today and into the future."[4] Implicit in this definition is recognition that city trees provide a wide range of benefits; that the

[1] O'Farrell, Simon, quoted in Geoffrey L. Buckley, Dept. of Geography, Ohio University, Athens, Ohio, Chapt. 3 of book pending publication

[2] H. D. Gerhold and S. A. Frank note in "Our Heritage of Community Trees" that Philadelphia may have hired the first professional urban forester in the United States in 1896.

[3] American Forests, The national urban forest conference, call for papers http://www.americanforests.org/graytogreen/conference/cfp.php

[4] Clark et al. 1997, cited in Elmendorf, William, Journal of Arboriculture, Jul, 2003.

regeneration of the urban forest requires intervention and management; and that the urban forest exists within defined geographic and political borders and includes both publicly owned and privately owned vegetation.[5]

The Tree Canopy Goal

Imagine you are a bird flying above Baltimore City. What would you see? Weaving in amongst the built landscape, are islands and ribbons of continuous tree cover formed by the crowns of trees, or tree canopy. 20 percent of Baltimore's land lies under a canopy of trees. While this natural resource is a good start, it falls significantly below the average canopy in cities nation-wide, which is 33 percent.[6]

In March of 2006, Baltimore City adopted a tree canopy goal to increase the existing canopy to 40 percent within 30-years timeframe, or doubling the existing canopy. The city agreed to set an urban tree canopy goal following a Chesapeake Bay Program Riparian Forest Directive. The Maryland Department of Natural Resources with the United States Forest Service and University of Vermont Spatial Analysis Lab provided technical assistance and coordinated with city officials to recommend 40 percent as the stated goal. This amount of canopy is also consistent with the recommendations of American Forests, a national non-profit organization.

Benefits of the Urban Forest

The benefits of the urban forest have been clearly established through quantitative studies. Chapter 1 will summarize findings established specific to Baltimore. More generally, the following benefits of the urban forest are recognized:

- Conserving energy, by providing shade and evaporative cooling through transpiration;
- Improving local and global air quality by absorbing carbon dioxide and ozone, adsorbing particulate matter, and producing oxygen;
- Reducing storm water runoff and the potential for soil erosion;
- Increasing real property values and increasing visitation of commercial sites;
- Reducing wind speed and directing air flow;
- Reducing noise pollution;
- Providing habitat for birds, small mammals and other wildlife;
- Enhancing visual and aesthetic qualities that attract visitors and businesses and serve as a source of community image and pride.[7]

[5] Ibid.
[6] Dwyer et al. 2000. Connecting people with ecosystems in the 21st century: an assessment of our nations urban forests. USDA Forest Service: Pacific Northwest research station. http://www.fs.fed.us/pnw/pubs/gtr490/gtr490.pdf
[7] International Society of Arboriculture, Tree Ordinance Guidelines, www.isa-arbor.com/publications/tree-ord/ordprtla.aspx

Goals of the Urban Forest Management Plan

Eight goals underlie the recommendations developed in the Urban Forest Management Plan. Each of these contributes to increasing and maintaining the urban forest's structure health and benefits.

- Establish trees covering 40 percent over the land area of Baltimore;
- Maintain trees in a healthy condition through good cultural practices;
- Establish and maintain an optimal age distributions and species diversity;
- Enhance the tree- growing environment;
- Select, locate, and maintain trees appropriately to maximize benefits and minimize hazard, nuisance, and conflicts with infrastructure.
- Increase opportunities for planting;
- Promote the efficient and cost-effective management of the urban forest;
- Foster community support for the urban forest and the proper care of trees;
- Educate the civic community on the value of trees and best practices for their care.

Contents of the Plan

The plan is organized into four chapters. After a brief natural history of the city's forest, chapter 1 characterizes the forest including its composition and distribution as well as the benefits. An opportunity analysis describes the current open grass areas as opportunities to increase canopy based on land use.

Chapter 2 reviews the existing maintenance structure of Baltimore's public trees including street trees, park trees and forests, and the trees on the properties of the Department of Housing and Baltimore City Public Schools.

Chapter 3 summarizes existing threats to the urban forest based on criteria established in Clark's forest sustainability model that includes characteristics of the resource, the community framework, and the management framework.

Chapter 4 consists of recommendations for meeting the 40percent percent goal and sustaining the urban forest.

Chapter 1: Baltimore's Urban Forest

Baltimore's urban forest is a complex assortment of plant communities that includes patches of naturalized forest, trees planted in the landscape and in street rights of way and volunteer trees in a stage of succession[8] in areas where the land use is in transition. The nature of each of these types of plant communities will differentially drive the management decisions for sustaining the urban forest.

Currently, the characterization of Baltimore's trees and forests is limited to several individual forest surveys (See APPENDIX A) in the parks and a citywide random sampling performed in 1999 by the US Forest Service.[9] A city-wide street tree inventory does not exist and so the character of street trees is difficult to describe with accuracy.

Natural History

When European settlers arrived in the 17th century, Maryland was nearly completely covered by an Oak-Hickory forest with a closed canopy, excepting some open areas maintained by Native Americans.[10] The virgin forests were remarkable, as described by Father White, chaplain to the first colonists at St. Mary's in the 17th century: "Fine groves of trees appear, not choked with thorns or undergrowth, but growing at intervals as if planted by the hand of man, so that you can drive a four-horse carriage where you choose through the midst of the trees so straight and tall that beams sixty feet long and two and a half feet wide can be made of them".[11]

The composition of forest remnants has changed dramatically since that time due to cultural practices. Lands were cleared in the 18th century for wheat and tobacco farming, for structural material, and later to produce charcoal to drive the iron works industry. Concentrations of city dwellers began urbanizing Baltimore in the early 18th century. By the end of the 19th century, 60-80percent of the Chesapeake Bay watershed had been cleared.[12]

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[8] Succession is the orderly process of one plant community gradually or rapidly replacing another. In Baltimore if left undisturbed these areas would succeed to a forest.

[9] Nowak, D. 1999. Baltimore's urban forest. Unpublished report available from USDA Forest Service, Northeast Research Station, Syracuse, NY.

[10] Kays, Jonathan S., 1995 Woodland Management: Maryland's Forests--Past, Present, and Future, Regional Extension Specialist-Natural Resources, Western Maryland Research and Education Center

[11] Vokes, H.E., 1957, Geography and Geology of Maryland, Maryland Geological Survey.

[12] Foreseman, T. The Baltimore-Washington Regional Collaboratory Land-Use History Research Program http://www.city-data.com/us-cities/The-South/Baltimore-History.html The Baltimore-Washington Regional Collaboratory Land-Use History Research Program

Forest re-growth occurred in much of Maryland as property was abandoned first after the civil war and again during the depression. As a result, most of the regions forests today are second-growth stands. Most forests are younger than 100 years and few if any are older than 150 years.

Baltimore's Naturalized Forest Patches

Baltimore City owed its early economy to the export of locally grown tobacco and milled flour, which was exported from the port as early as 1742.[13] As a result, some of the outer areas that are now inside city limits, reflected this agrarian land use. Druid Hill Park, for example was once an estate where tobacco and fruit orchards grew.

Druid Hill is located on the fall line where the Coastal Plain and Piedmont physiographic provinces meet. In the 18th century, agriculture occurred on the gently sloping lands of the Coastal Plain and naturalized forest grew on the steeper ravines of the Piedmont Plateau where some logging occurred. This old mature forest remains today, in a large part because the city purchased the property for a park.

Other parks within Baltimore, such as Leakin Park and Cylburn Arboretum also contain patches of old mature forests of the Piedmont plateau. Their preservation as park land in the 19th and 20th century protected them from some of the clearing that occurred throughout Maryland. Consequently, some of the oldest stands of forest in the region are found in Baltimore's parks. Some biologists have remarked on the significant size of trees in the groves in Druid Hill,[14] and one biologist speculated that cutting might never have disturbed a stand of forest in Leakin Park.[15] In addition to parkland, some naturalized forests—mostly on steep slopes—are owned privately. The stands found in Baltimore on undisturbed sites include plant associations of oak-hickory , mixed mesosphytic, and tulip poplar.[16]

The blocks of mature forest of Baltimore City are considered, on a regional scale, to be small, disconnected patches of edge habitat. While some forest interior dwelling birds have been found breeding in our park forests, by and large, the significance of these forest patches for maintaining regional biological diversity is minimal. One exception may be Leakin Park, which was ranked with a "medium" ecological value in Maryland's Strategic Forest Lands Assessment.[17]

The value of Baltimore's mature forests lies more with such environmental services as air and water quality, evaporative cooling, and carbon sequestration. In addition, the forest patches provide habitat for a wider variety of local species than is found in most other parts of the city. These values are particularly significant for urban centers where many people can benefit and where environmental pollution is prevalent. Finally, though the size of the forest patches may limit their ecological value in the region, individual trees within some of Baltimore's stands are remarkable due to the fact that they have been preserved for over 150 years.

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[13] Baltimore History: http://www.city-data.com/us-cities/The-South/Baltimore-History.html
[14] Davis, Charlie, biologist and Chris Stuhlinger, Maryland Forest Service, 1993, private conversation.
[15] Black, Leakin Park Forest Assessment.
[16] Brown, Russell G. and M. L. Brown, Woody Plants of Maryland.
[17] Maryland Department of Natural Resources, 2003, Maryland Strategic Forest Lands Assessment

The patches of naturalized forests in Baltimore City have a significant presence of exotic invasive plants at ground and under story levels of the forest, threatening the sustainability of the patches as they are currently structured.

City-wide Characterization of the Urban Forest

A recent study by the US Forest Service is the most comprehensive source of information characterizing Baltimore's urban forest city-wide.[18] Researchers collected and analyzed data from 202 permanent plots in all land uses, 0.1 acre in size in 1999. Plots were measured again in 2001 to establish rates of tree mortality. All trees were counted within the plots including naturalized forest trees, volunteer, and planted landscape trees.

The purpose of the UFORE study was to assess the urban forest in Baltimore, to include its structure (e.g., species composition, stem diameter distribution, tree condition,) and impact on air quality and atmospheric carbon dioxide (CO_2). Assessing the entire urban forest is a relatively new activity, however, and management conclusions are not simply prescribed, due to the diversity of variables. For purposes of this management plan, some of the data below is applied to the principles of urban forest management that are have more typically been used as guidelines for street tree and naturalized forest management.

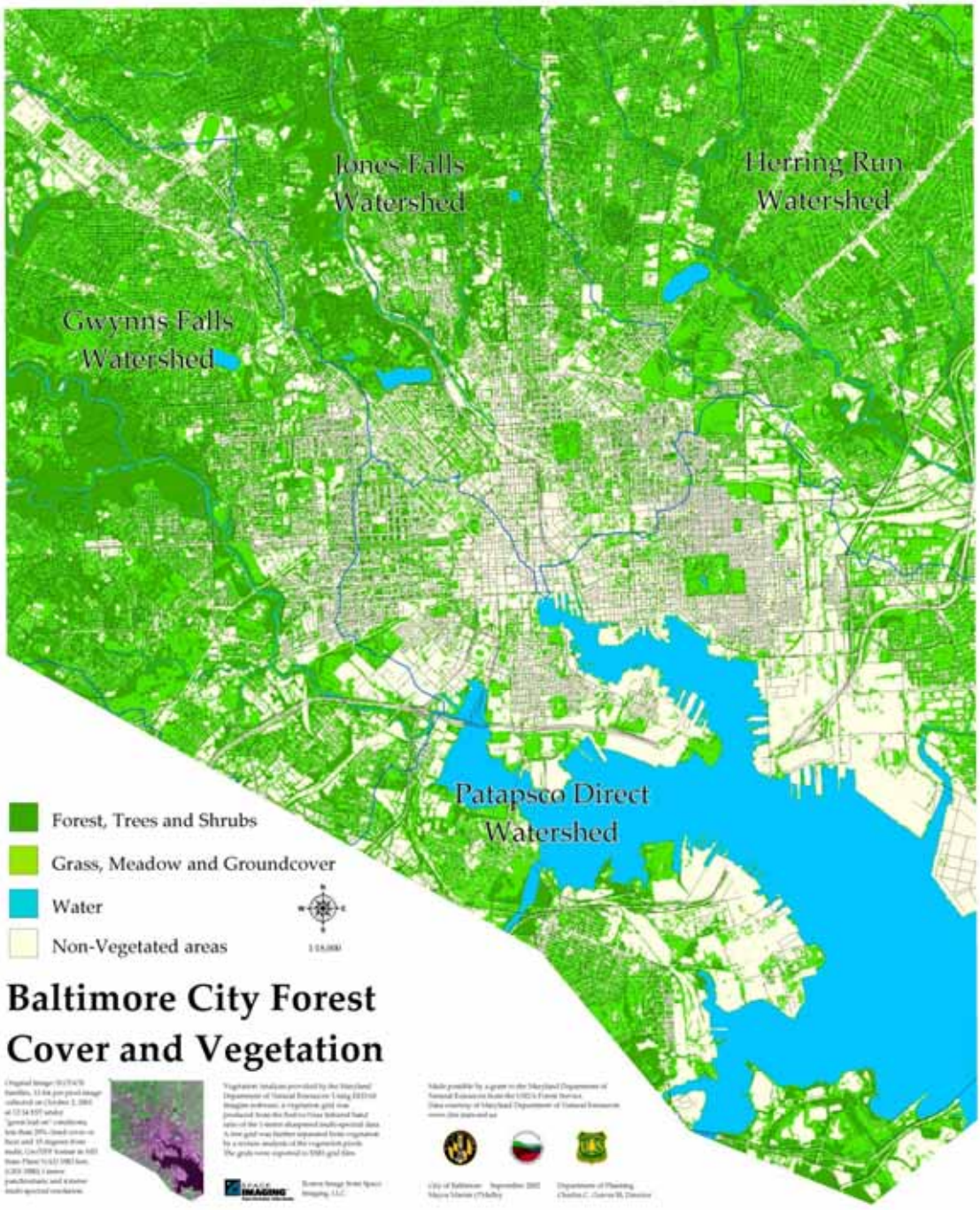
Land Cover

According to land cover analysis by the Baltimore City Department of Planning, the current tree canopy of Baltimore covers 20 percent of the land. Grass covers 27 percent and the remainder is hard, developed surfaces including buildings and pavement (Figure 1).

Tree cover varies by land use (Figrure 2) and is highest in "forests" (59.3 percent), followed by urban open (48.8 percent), medium/low density residential (32.4 percent), high-density residential (22.2 percent), institutional (12.4 percent), commercial/industrial (11.8 percent), transportation (10.0 percent), and barren land (0.8 percent). areas include trees as well as brush brush areas that have such vegetation types as sumac, vines, rose, and tree seedlings, which explains why there is only 59.3 percent tree coverage in the forested land use.

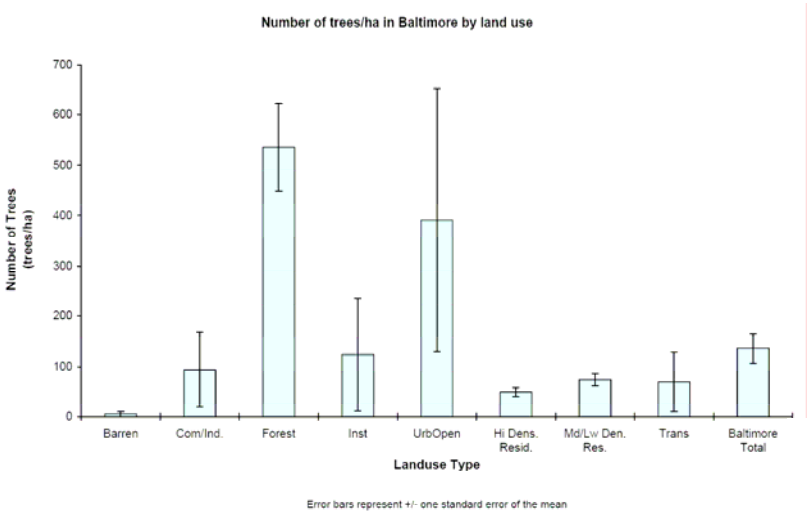
[18] **UFORE** is an acronym for "Urban Forest Effects" and refers to a computer model that calculates the structure, environmental effects and values of urban forests. The UFORE model was developed in the late 1990s by researchers at the United States Department of Agriculture (USDA) Forest Service, Northeastern Research Station in Syracuse, NY. Lead Researcher for Baltimore's UFORE was David Nowak and data collection occurred in 1999. The purpose of the UFORE was to assess the urban forest, including its structure and impact on air quality and atmospheric carbon dioxide.

Figure 1
Baltimore City Vegetation Cover



Urban open land includes are golf courses, parks, recreation areas (except areas associated with schools or other institutions), cemeteries, and undeveloped land.

Figure 2
Baltimore's Vegetative Cover



Species Diversity

Baltimore's urban forest has 80 different species, indigenous to the area, native to the region as well as exotic, i.e. native to another continent. The most common species are White and green ash, at 10 percent of the forest. Other common species occurring at around 5 percent each are American elm, American beech, black cherry, tree of heaven and black locust. 6 percent were "other species", most of which were dead.

A street tree sampling of 1,500 trees performed in 1980, identified 66 different street tree species and 1,502 trees. Of these records, only 4 trees were ash, or less than one percent. In 2004, under the management structure of the previous decade, about 60 different street tree species were planted per year and about 40 different genera. Of those planted, about 5percent per year may have been planted as ash if patterns were similar to 2004. In fall, 2006, the Forestry Division planted 50 species and 25 genera. 6 percent of the trees planted in 2006 were ash.

Baltimore's urban forest is dominated in leaf area by American beech, white/green ash, silver maple, tulip tree, and American elm. **APPENDIX B** lists all of species found within the UFORE plots and their frequency of occurrence.

Table 1 shows some of the habitat requirements for the six most common species. Table 2 shows the most common species found on each land use. By comparing the tables, some patterns can be inferred. Tree of heaven which are most likely volunteer trees dominate barren, high-density residential, and transportation land uses. White/green ash, a native plant that quickly invades sites, was most common in institutional and urban open lands. American beech forest communities predominated the forest plots sampled.

Table 1
Habitat Characteristics Of Major Species Of Baltimore's Urban Forest

Species	Frequency (percent)	Habitat Characteristics
White/green ash	10	Common tree in natural forests of Baltimore region in wetlands and adjoining streams. Common street tree and also canopy tree for landscaping.
American elm	6	Common in bottomland forests. Often invades disturbed sites. Some large canopy street trees and landscape trees still present, after decimation by Dutch elm disease in the mid 20th century. Some resistant cultivars currently planted.
American beech	6	Common in mixed mesophytic forest, especially on north facing slopes. Previously planted in parks. Not often planted now.
Black cherry	6	Native to eastern deciduous forest. Shade intolerant, occurs in open areas and edges of forest. Often found with early succession invaders on disturbed sites.
Black locust	6	Escaped cultivation and naturalized in the mixed mesophytic forests in Western Maryland. Likes lighter textured soils.[19] Often found invading the sandy shorelines of Baltimore harbor.
Tree of heaven	5	Exotic plant introduced from China in the 18th century. Invades disturbed sites. Shade intolerant does not invade forested area, but will inhibit growth of new forests on abandoned sites. Prolific seed producer and spreads by roots.

Table 2
Five Most Common Species By Land Use[20]

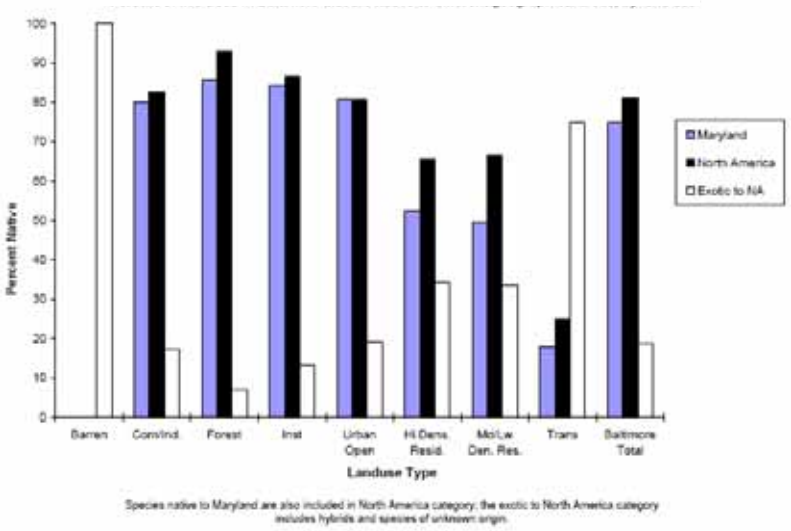
Land Use	Species
Commercial Industrial:	Black locust, American elm, box elder, tree of heaven, American sycamore
Forest	American beech, sassafras black cherry, flowering dogwood
Institutional	White ash, American beech, American elm, Norway maple, red maple, tulip tree, common pear
Urban open	White/green ash, Chinese elm, white oak, black cherry, eastern white pine
High density res.	Tree of heaven, white mulberry, silver maple, eastern red cedar, red maple
Med/low density res.	Norway spruce, silver maple, black cherry, white/green ash, tree of heaven
Transportation	Tree of heaven, red maple, other species, willow oak silver maple, American elder, American elm
Barren	Tree of heaven

[19] Huntley, J.C., Black Locust
http://www.na.fs.fed.us/pubs/silvics_manual/volume_2/robinia/pseudoacacia.htm

[20] Includes more than fives species where “ties” existed in the top five ranking

Ash is a common tree in the urban open areas, which includes parkland and cemeteries, and undeveloped urban land. These trees may be a combination of both planted trees and volunteer. High-density residential properties have a large amount of volunteer exotic species. Medium and low density residential have many planted Norway spruce as well as silver maple that may be both volunteer and mature planted species.

Figure 3
Percentage of exotic species in each land use



Natives and Exotics in Baltimore's Urban Forest

Since early colonization of North America, new species have been introduced to the region through a variety of ways. While most of these introduced species are benign, about 15percent become invasive., causing a negative impact to the native plant communities.

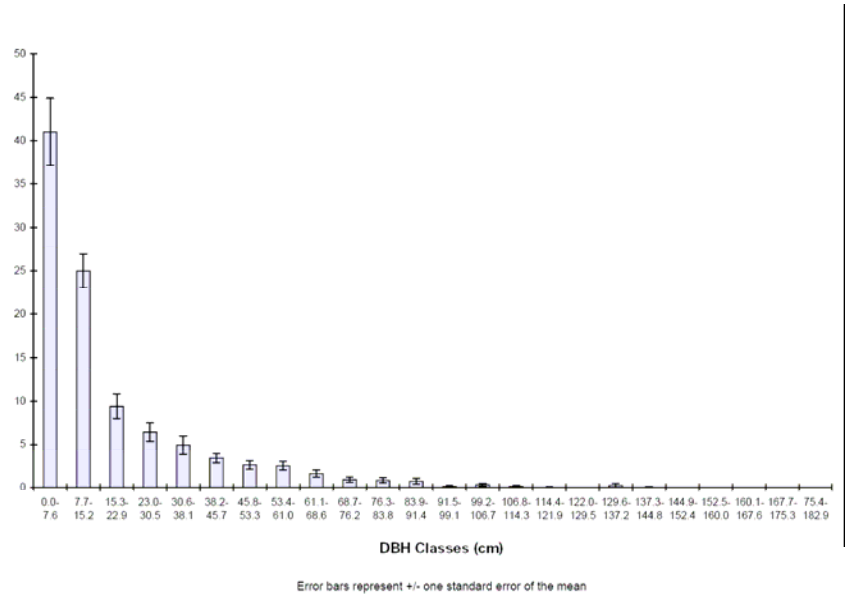
Nearly one third of the trees sampled in Baltimore's UFORE were exotic species. The most prominent exotic is tree of heaven, which was present at a frequency of 5 percent of the total urban forest. Widely distributed in the US, Tree of heaven is common in cities. The tree is an invasive plant, which impedes the development of a diverse native forest on abandoned sites.[21] Chinese elm was present in 3 percent of the urban forest and Norway maple represented 1 percent. All of the trees found on barren sites and two thirds of the trees in transportation right of way were tree of heaven.

Tree Size Class

The size class distribution as measured by diameter at breast height (dbh) of the trunk is a common indicator of the relative size/age of a forest. The Baltimore forest has size class distribution that favors small/young trees (Figure 4). Two thirds (66percent) of the trees are small/young, or less than 6 inches dbh, less than one third (29percent) are medium sized or mature and only 5percent are large or "over mature". One third of the small trees (less than 3") dbh are white/green ash, black cherry, tree of heaven, and Chinese elm.

[21]Swearingen, Jil M. National Park Service, Washington, DC for Plant Conservation Alliance http://www.nps.gov/plants/alien/fact/aial1.htm

Figure 4
Size Class Distribution of Baltimore's Trees



Tree Condition

Baltimore's urban forest has a range of conditions. More than half the trees are in good or excellent condition. One quarter of the trees are in fair condition and nearly one quarter of the trees are in poor, critical, dying condition or already dead. The average life-span of a tree in Baltimore is 15 years and only one third of the tree population lives past age 15.

Benefits of Baltimore's Forest

Many researchers in the last decade have documented the benefits of the urban forest. These benefits are generally environmental services, as compared to more traditional forestry practice where trees are valued for timber products.[22]

[22]Galvin, Michael et al. 2000. Maryland's forest conservation act: a process for urban greenspace protection during the development process. Journal of Arboriculture 26(5)

Urban forests play important roles in urban ecosystem function (Rowntree 1998) by providing air-pollutant reduction (Nowak 1994; Scott et al. 1998;Scott et al. 1999); carbon emission reduction, storage and sequestration (Nowak 1994a,b; McPherson1998); urban heat-island cooling (McPherson et al.1994); structural heating and cooling cost reduction(Akbari et al. 1992; McPherson 1994; Simpson and McPherson 1996; Simpson 1998); stormwater runoff reduction through interception and canopy storage of precipitation (Xiao et al. 1998); nitrogen, phosphorus, and sediment interception (Lowrance et al. 1995); wildlife habitat creation (Schwaab et al. 1995; Dunster 1998); and improvement of urban aesthetics (U.S. Forest Service 1991; Thompson et al. 1999)

"Our towns and cities have to remain livable. They can't just be concentrated with emissions and waste products. We need trees to help clean the water, clean the air, and to keep these places environmentally viable." [23]

Mike Galvin Maryland Department of Natural Resources

The value of Baltimore's urban forest resides in eight categories:[24]

- ***Water quality****: Trees absorb rain in their leaves and roots, reducing storm water runoff, erosion and flooding. Trees also filter nutrients and sediments from rainwater, reducing pollution to local waterways. When too few trees remain, communities increasingly rely on costly engineered solutions to manage storm water and reduce pollution.*

- ***Air Quality****: Trees filter pollutants carried in the air that affect both local rivers and human lungs. Trees are especially effective at storing carbon, which helps to reduce global warming. They also remove particles of dust, smoke and ash, as well sulfur dioxide and nitrogen oxides, two major components of acid rain.*

- ***Energy Savings****: Trees are natural insulators that cool buildings during the summer and keep them warm during the winter. Homes with well-placed trees cut energy costs by as much as 25 percent.*

- ***Temperature Control****: Trees take a bite out of the urban heat island, where buildings, paved surfaces, and automobile engines create air temperatures that are 2 to 10 degrees hotter than rural communities.*

- ***Wildlife Habitat****: Urban trees offer refuge for mammals, insects and birds, including migratory species. Along streams, they support fish and amphibian habitat by cooling the water and creating shelter and feeding grounds along fallen branches and leaves.*

- ***Recreation:*** *In urban areas, wooded areas are valuable settings for recreation and exercise, which is especially important when 75 percent of Americans aren't getting the exercise they need.*

- ***Quality of Life****: Urban settings filled with trees foster human connections to the environment and to one another by reducing stress, increasing the use of public spaces and offering healthier play for children. Studies have also indicated that work productivity and patient recovery are aided by a green environment. Drivers tend to be less aggressive on tree-lined thoroughfares, while consumers linger longer and spend more money. Homes with mature trees can sell for at least 7 percent more than those without. And, a Baltimore study showed that more than half of a neighborhood's residents consider moving away when tree cover falls below 15 percent.*

Many of these functions were specifically measured in Baltimore's UFORE (Table 3) and a monetary value was calculated based on a model that factors the total societal costs. One of the important functions of the urban forest is removing carbon from the atmosphere that contributes to global warming and climate change. Trees store the carbon in a process called carbon sequestration and also remove other "greenhouse gases" such as carbon dioxide, ozone, and sulfur dioxide.

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[23] Lutz Lar. 2006. Urban tree canopy effort branching out across watershed. www.bayjournal.com/article December.

[24] Sprague, Eric et al. 2006. The state of the Chesapeake's forest. Arlington, VA: The Conservation Fund. Cited by Lutz, Lar. 2006. Urban trees extend beyond their beauty. www.bayjournal.com/article December.

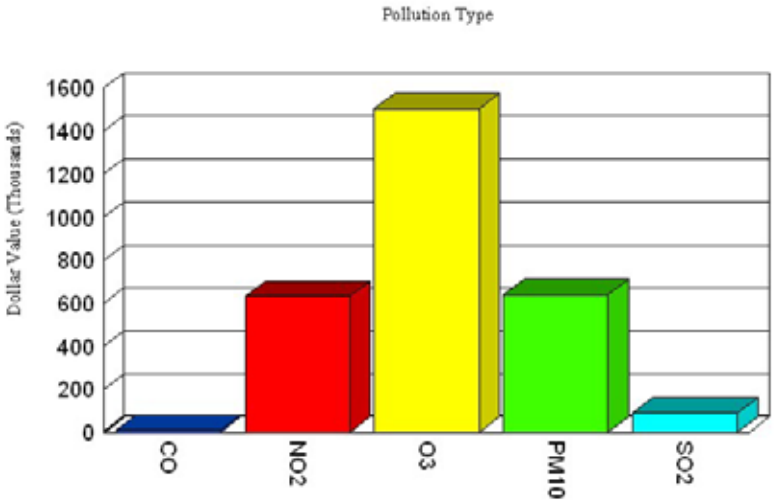
Table 4
Environmental Value of Baltimore's Urban Forest[25]

Environmental Service	Total Savings to Baltimore City	Mechanism
Decreased Building Energy Use	$3.3 million per year	Shading of building surfaces in winter and summer, blocking winds, and evaporative cooling.
Carbon storage	$10.7 million	Each year, a growing tree sequesters carbon; Trees then store a large amount of carbon in their tissue.
Net carbon sequestration	$219,000 per year	
Air pollution removal	$3,757,000 per year	Pollution removal of ozone, particulate matter, nitrogen dioxide, sulfur dioxide, carbon monoxide that purifies the air.

Ground Level Ozone

Ozone levels in Baltimore exceed the air quality standard for set by the EPA for compliance with the Clean Air Act. The city's trees help improve human health and environmental quality, particularly with respect to this pollutant.

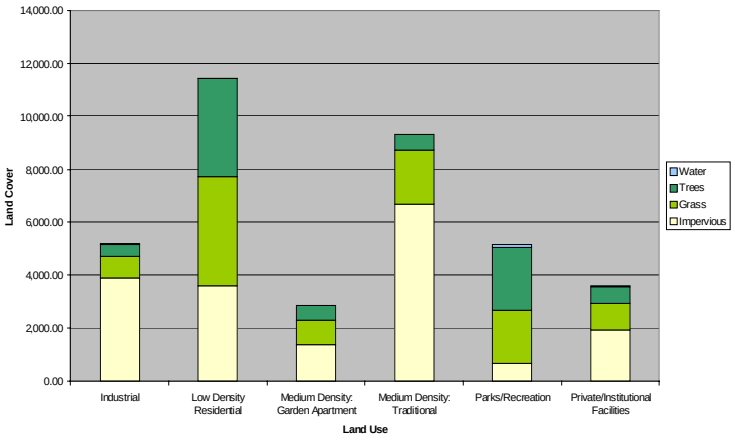
Figure 5
Estimated Pollution Removal in Baltimore



[25] Nowak, Baltimore's UFORE

Ozone is a major element of urban smog. Ozone can limit the ability to take a deep breath, and can cause coughing, throat irritation, and breathing discomfort. There is also evidence that ozone can lower resistance to respiratory disease (such as pneumonia), damage lung tissue, and aggravate chronic lung disease (such as asthma or bronchitis). Children and those with pre-existing lung problems (such as asthma) are sensitive to the health effects of ozone. Even healthy adults involved in moderate or strenuous outdoor activities can experience the unhealthy effects of ozone.

Figure 6
Acreage of Land Coverage by Land Use



Opportunities to Increase Baltimore's Tree Canopy

An assessment of Baltimore's forest will serve as a basis for managing the existing resource. Another part of the Urban Forest Management Plan, however, will identify measures for increasing tree canopy in areas where it does not currently exist. In order to inform these recommendations, an opportunities analysis by Baltimore City Department of Planning identified areas, by land use, where new trees can most easily be established.

Figure 8 illustrates which land uses have the greatest opportunity for increasing tree canopy. While some areas currently covered by pavement and buildings (impervious cover) may eventually allow for tree canopy, currently grass or pervious cover will most easily lend itself to increased canopy. While some increase canopy may occur on park land, the majority of planting potential (or release of grass areas for natural regeneration) occurs on private property.

Chapter 2: The Management Framework of Public Trees

The public trees of Baltimore City include street trees in the public right-of-way, trees in park groves, naturalized park forests, and trees on properties of the Baltimore City Public schools and Housing Authority. Management of street and park trees and forests is performed by two organizations within the Department of Recreation and Parks: the Division of Forestry and the Office of Park Conservation and Community Outreach. Public schools and Department of Housing manage the trees on their properties.

1. Baltimore City Forestry Division

The Forestry Division has the responsibility of maintaining all public trees. The major focus of work, however, is the trees on city rights of way, including both streets and medians. Trees on parkland are a minor focus due to budget constraints and the demands imposed by constituent requests for planting and service on street rights of way.

The Forestry Division currently has 40 employee positions (Figure 8). The City Arborist is the chief officer and was hired in 2005 after the position was vacant for nearly a decade. Three positions require International Society of Arboriculture (ISA) certification-- the City Arborist, the Assistant City Arborist, and the Forestry Specialist. The forestry specialist is a new position and coordinates plantings. The division has 5 tree maintenance crews (three workers each), 2 stump-grinding crews (1-2 workers each), and 2 log loader crews. The division hires nine tree maintenance crews, three members per crew, by contracting with tree maintenance companies.

The new arborist has been introducing new standards of practice including:

- No new planting in existing tree pits less than 4'X 4' in dimension;
- New pits must be a minimum of 4 x 8' dimension;
- Grass strips minimum 4' wide, with some exceptions down to 3' wide;
- Spacing between canopy trees 30' minimum, and for understory trees, 15' apart.

Other new standards included in this plan will be implanted over time as resources allow.

The major activities of the Forestry Division are planting, pruning, removing dead trees and tree work caused by storms or wind. Tree work is scheduled on an as-needed and emergency basis as garnered from citizen service requests (CSR) from the citywide one-call system, Cititrak. City residents call 311 to request work on city trees, as well as any other service that is needed government-wide. Dispatchers trained in the Cititrak system (but not trained in forestry practice) then forward requests to the proper agency. Once the Forestry Division receives the citizen service request (CSR), Citistat[26] staff at the Mayor's office monitor the division for compliance with the following performance criteria: 300 days for tree pruning, and 180 days for tree removal.

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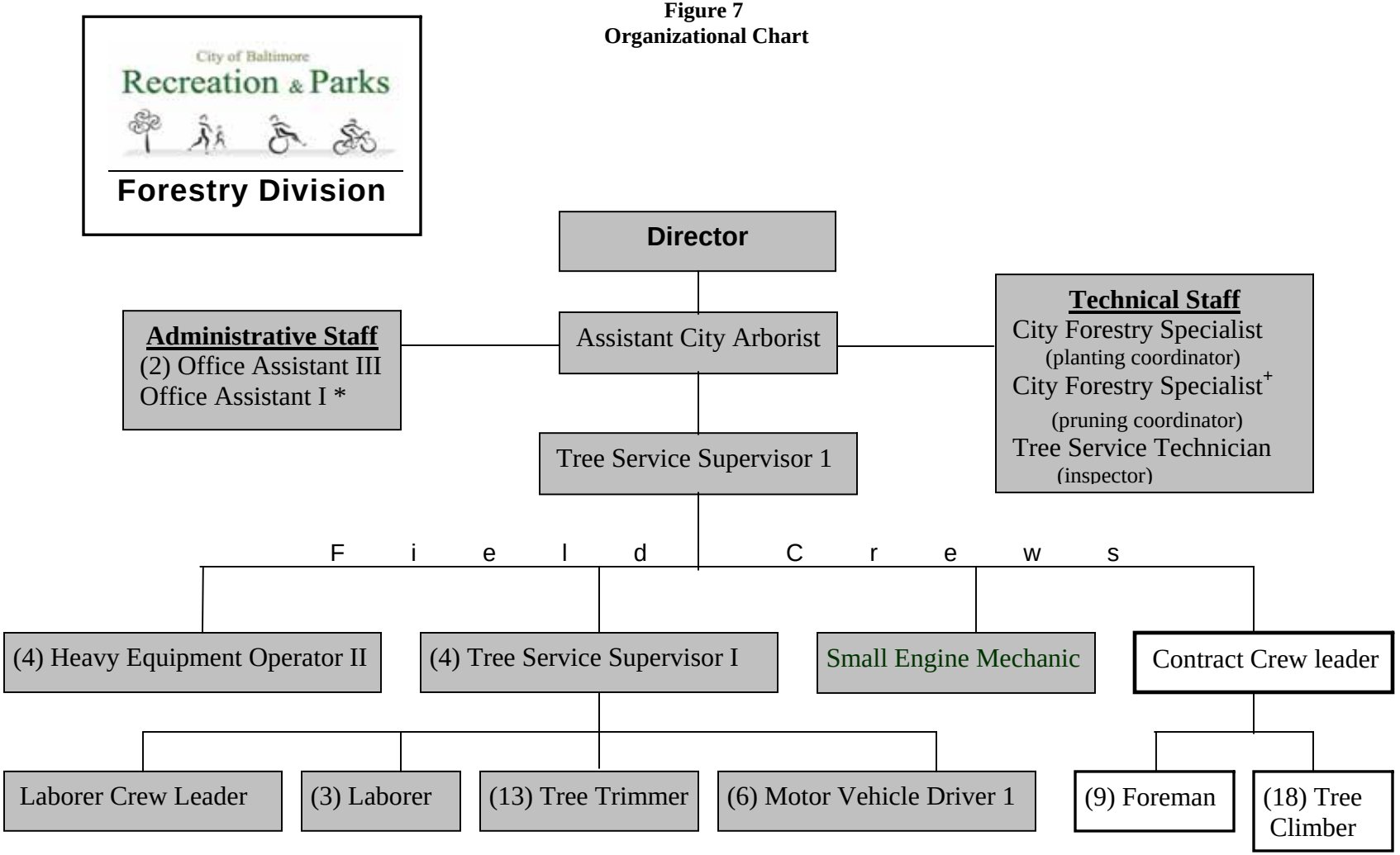
[26] CitiStat is an accountability tool based on the ComStat program pioneered in the New York City Police Department. Agency heads come to a CitiStat meeting every other week with deputy mayors, and key cabinet members. Days before each meeting, the agency submits data to the CitiStat team covering a two-week period. The CitiStat team analyzes the numbers and formulates questions designed to explain the data and highlight problem areas. http://www.ci.baltimore.md.us/news/citistat/index.html

Figure 7
Organizational Chart



+ Contractual Position
*Temporary Position

Tree Pruning

Tree pruning is the largest part of the Forestry Division's work. A tree inspector examines each location where a citizen requests pruning and makes a recommendation. There are two levels of priority:

- Priority 1: trees that are a hazard for people or property;
- Priority 2: are trees that need pruning but are not potential hazards.

When inspecting a tree-pruning request, three potential conflicts are noted:

- Conflicts with sidewalk and roads;
- Conflicts with signs and streetlights;
- Conflicts with buildings.

Where a citizen files a complaint about a to conflict between a tree and buildings, the Division will negotiate with the property owner, encouraging them to tolerate some of the real or perceived conflicts with buildings as the preferred alternative to pruning.

Tree Planting

Tree planting operations occur in the spring and the fall and the planting rate is determined by the City Arborist based on budget and labor capacity. Currently, the Division plants 1,000 trees per season. At the recommendation of the City Arborist, the City purchasing office submits a request for trees that includes specifications for quality material. The contract is awarded to the lowest bidder. All trees are inspected when delivered for conformance to the American Standard for Nursery Stock (ANSI Z-60). This includes caliper size, root ball size, and checking for co-dominant leads.

The Division arranges for planting seasons to occur from mid April to mid June and from mid October to mid December. However, variables that influence these dates include the City procurement process as well as tree deliver dates and emergency tree work. The Division is in transition in acquiring and organizing equipment to allow two crews of four people each to perform the planting-- each crew with two trucks, each towing a trailer. One truck will carry a watering tank and a dingo (a hydraulically powered portable auger), the other truck will carry mulch and trees.

Plantings in the street right of way are scheduled when citizens request trees on sites adjoining their property. An application is available by way of the Forestry Division website[27] or by calling and requesting one by phone. Citizen groups may provide a list of potential planting sites, providing there is signed permission from the adjoining property owner. All requests must have a commitment from an individual or a group to water and mulch new trees for a period of two years. Currently city crews plant the majority of trees and after planting and leave a door hanger with care instructions (**APPENDIX C**).

In the event that a tree request requires the opening of a new tree pit, the person requesting the pit is responsible for hiring a contractor to remove the concrete. A tree inspector from the Forestry Division must first mark the correct size and location of the pit. The Parks and People Foundation can sometimes provide grants for tree pit construction.

[27] http://www.ci.baltimore.md.us/government/recnparks/forestry.htm, phone: 410 396-6109

When a community plants trees through volunteer labor as part of a community building effort, all locations are first reviewed by the tree inspectors of the Forestry Division to approve the location and make recommendations on species appropriate for the site.

2. The Office of Park Conservation and Community Outreach (PCCO)

The goal of PCCO is to establish and maintain an optimal environment for Baltimore City's urban-forested parkland and street trees through sustainable management plans and community involvement. The PCCO office works to provide an understanding of the urban forest through education and training programs that foster community involvement in conservation and care for urban-forested parklands.

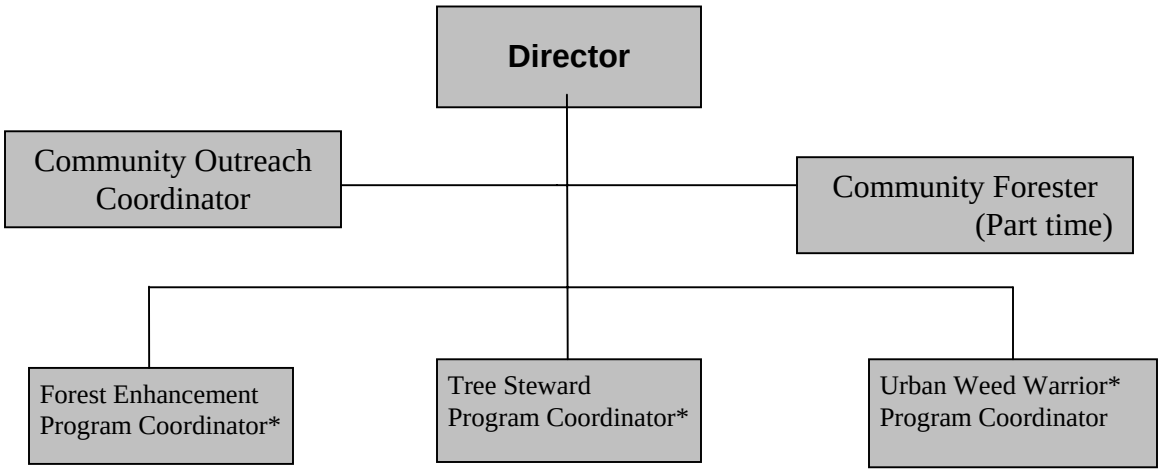
The educational programs promote the benefits of a healthy urban forest and best management practices. PCCO manages the urban ecosystem as a cohesive unit, consistent with watershed management principals of protecting and enhancing water quality and air quality in the City of Baltimore.

PCCO has a director and four ½ staff people to manage four areas of emphasis or programs (Figure 9)

Figure 8

City of Baltimore
Recreation & Parks

Office of Park Conservation & Community Outreach



* Grant funded

Community Forestry Program

- Organizes and leads volunteer park tree plantings with friends of parks groups, community associations, churches, businesses and other civic organizations
- Maintains young park trees (for 6 years after planting)
- Inventories park trees
- Conducts “tree-based” environmental education lessons
- Designs tree planting schemes
- Collaborates with communities on park greening initiatives

Forest Enhancement Program

- Creates management plans for parks
- Implements plans with a small contractual crew

Tree Steward Program

- Offers workshops to educate volunteers about proper tree care and maintenance techniques.
- Helps organize street and park tree plantings with trained tree stewards.
- Provides professional development training for Baltimore City staff and other partner organizations.
- Provides a manual for use with the program
- Provides a database of tree planting and maintenance activities that occur through the program
- Distributes a brochure that informs the public about the benefits of trees as well as advertises the program.

Urban Weed Warriors Program

- Offers training for citizens on the threat of invasive species to local ecosystems, teaches how to identify them and the importance of removing them.
- Provides “outdoor experiences” for public school children relating to invasive species and why they are undesirable.
- Coordinates monthly local volunteer weed pulls to encourage hands-on involvement in the community.
- Sends out newsletters to keep citizens updated and involved. Supports education efforts by featuring information on different invasive plant species every month.
- Produces brochures to educate nurseries and their customers about the negative effects of planting invasive species.

School Program

- Provides hands-on programs to educate children about the importance of trees and the threat of invasive species
- Conducts native tree plantings at schools and in parks.
- Conducts tree maintenance events at schools and in parks.
- Works with school staff and administration to support school site greening.

3. Baltimore City Public School: The Grounds Shop

The Grounds Shop of the Baltimore City Public Schools System performs outside maintenance, renovation and upkeep of the grounds of approximately 180 Baltimore City public Schools. They maintain trees, lawns, and other plants, athletic fields, concrete and asphalt to keep properties safe, healthy and presentable. Included in this program are 360 acres of hard surface and 1600 acres of turf and landscaping.

The Grounds Shop has a staff of 65 and about 5 staff members perform tree trimming. Stihl, Incorporated, a manufacturer of chain saws trained these individuals. There are no tree climbers, International Society of Arboriculture certified arborists or Maryland Licensed Tree Experts on staff.

The shop has two chippers and a trailer-mounted aerial lift. When tree work exceeds the ability of the staff and equipment to handle safely, the manager calls the Forestry Division at the Department of Recreation and Parks.

The Horticulture section of the Grounds Shop provides decorations for special events. They are located at Bragg Nature Center in Baltimore County, an 8-acre historic nature center that no longer has educational programming. A tree nursery for school grounds once operated at the center.

The Grounds Shop in the 1990's worked with funds from the Department of Public Works Water Quality Section to remove asphalt and concrete on some school grounds reclaiming the sites to a green landscape. The Grounds Shop no longer manages this program, though various greening projects are performed through the efforts of non-profits such as the Parks and People Foundation.

4. Housing Authority of Baltimore City

The Housing Authority of Baltimore City (HABC) maintains properties they own through their maintenance crews. HABC has three categories of properties: family developments, elderly developments, and "scattered sites". There are 33 different developments and each development has a grounds maintenance crew that ranges in number between 1 or two people at high-density developments to 10 people at lower density developments with more grounds. One crew maintains the 3,000 scattered sites—mostly rowhouses and including vacant lots--. Most of the work of the grounds maintenance crews is grass cutting.

The Central Maintenance Office has 30 employees and offers additional support for each HABC crew, including two tree trimmers. For tree trimming, the office has a truck with a chipper and a stump grinder. Most of the tree work is in response to requests from development sites to address conflicts with electrical wires and other infrastructure. For larger jobs the office hires a contractor. HABC does not have a tree planting or management program for their properties.

In recent years, studies have documented the positive relationship between trees in public housing projects and the quality of life of their residents. One study was performed in 1997

at Chicago's Robert Taylor Homes (prior to its demolition, the largest public housing development in the world, with twenty-eight 16-story apartment buildings[28]). According to Frances Kuo, researcher of the University of Illinois Human-Environment Research Laboratory,

> *"Before we started our research I would have said, trees are nice, but the problems we're facing in our cities and our budgets are such that I'm not sure it's worth it. I think that through this research I have become convinced that trees are really an important part of a supportive, humane environment. Without vegetation, people are very different beings."* [29,30]

There are many opportunities in Baltimore for increasing the amount of vegetation in Baltimore's public housing projects—both the existing sites and through redevelopment projects.

Starting in 1997, many of Baltimore's high-rise housing units have been demolished with help from funds from the U.S. Department of Housing and Urban Development. These projects are then replaced with mixed-income developments at a lower rate of density, often increasing the associated green space and opportunities for trees. On October 19, 2006, Claremont Homes was the latest public housing complex to be demolished. The new housing development on the 60-acre site, Orchard Ridge, will include a large, recreational open space and a wooded area in the center of the site.[31]

5. Department of Housing and Community Development

The Department of Housing and Community Development (HCD) strengthens City neighborhoods by attracting investors, developers and homebuyers. The Department finances and guides strategic development projects to meet housing and neighborhood needs. Through the development process, opportunities may be available for increasing tree canopy on development sites

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[28] http://www.michaelsdevelopmentcompany.com/portfRobertTaylor.html

[29] Shortess, John, Producer, 1997. The forest where we live, Louisiana Educational Television Authority, http://www.lpb.org/programs/forest/chicago.html

[30] The study found that when compared to people who live in places without trees, residents of Robert Taylor Homes who live near trees have significantly better relations with, and stronger ties to their neighbors. They have more visitors, socialize more with their neighbors, know more people in their apartment building, and have a stronger sense of community than people who live in places without trees. They also like where they are living more, feel better adjusted to living there, and feel safer than residents who have few trees around them. Sullivan and Kuo's team made 100 observations of outdoor common spaces in two public housing developments. They found people gathered in common spaces that contained trees significantly more often than they gathered in spaces that had no trees. These findings held true for adults, for children, and for adults supervising children.

[31] The Baltimore Sun, Cited in Baltimore Housing News Archives http://www.baltimorehousing.org/index/EventDetail.asp?ID=196

Project 5000 is an initiative of HCD to return 5,000 vacant and abandoned properties in Baltimore to productive use. To date, the initiative has led to 6,000 acquisitions.[32] HCD has an aggressive schedule to hold competitive offerings for all City-owned property, resulting in a diversity of new development projects at a variety of scales and income markets. In the fall of 2006, Baltimore City Council approved $10.7 million to tear down hundreds of rowhouses in some of the most neglected neighborhoods to make room for mixed-income development. City officials believe that the properties will be easier to develop when combined into larger parcels, and as a result, will attract developers.[33]

The on-going redevelopment sponsored by HCD offers opportunities to increase tree canopy in sites that are currently impoverished of trees. Requests for development proposals, however, do not typically include specifications for increased tree canopy or open space.

[32] Bogen, J. 2006. New task force tackles vacant land, abandoned properties issues, U.S. Conference of Mayors, ttp://mayors.org/uscm/us_mayor_newspaper/documents/02_06_06/vacantland.asp

[33] The Baltimore Sun, Editorial, September 20, 2006 Laying the Groundwork for Affordable Housing, http://www.baltimorehousing.org/index

Chapter 3: Threats to a Sustainable Urban Forest

Sustaining the urban forest is a complex task that by nature requires the involvement of many disciplines, users, and managers. James R. Clark, recognized for his work in urban forest research, designed a model with three major components where criteria can be applied in order to work towards a sustainable urban forest[34]:

- ***The vegetative resource***
- ***The community framework***
- ***Resource management***

The criteria of Clark's model are listed below with the sustainability objectives and Baltimore's challenges are identified. Clark's objectives were adapted, augmented, and updated where necessary.

> ***A Sustainable Urban Forest***
>
> ***The naturally occurring and planted trees in cities, which are managed to provide the inhabitants with a continuing level of economic, social, environmental, and ecological benefits today and into the future.***
>
> *--James R. Clark et al*

CRITERIA FOR BALTIMORE'S VEGETATIVE RESOURCE

1. Canopy Cover

Sustainability Objective
Achieve climate-appropriate degree of tree cover community-wide.

Challenges
Currently, Baltimore's tree canopy is 20percent. According to Americana Forest, national conservation organization, at this level, the urban forest does not provide residents with the social and environmental benefits that are desirable, particularly for Baltimore's hot humid summers. In addition, Nowak estimated a 12 percent decline in 100 years and so today's tree canopy is not sustainable with current practices.

2. Age Distribution

Sustainability Objectives
Provide for an uneven age distribution of young and mature trees to maintain canopy cover relatively constant over time. Provide an on-going planting program hand in hand with the removal of dead and dying trees. Provide a tree inventory or sampling to assess age distribution for planning and monitoring.

[34] Clark, James R. 1997. A model of urban forest sustainability *in Journal of arboriculture 23(1): January*

Challenges
The Baltimore urban forest has a size class distribution of 66:29:5—favoring small/young trees that suggests either a high mortality rate of young trees or inadequate stocking of new trees or both. A more sustainable ratio would be a bell curve where medium size/ age trees would predominate. The average lifespan of a tree in Baltimore is15 years and only one third of the tree population lives past age 15 years due to vandalism, accidental damage, and establishment-related stresses. This mortality rate compares to the average expected service life of 10 to 25 years for urban trees generally as a result of compacted soils, limited rooting volume, impervious surfaces, heat irradiation, pollution, and other stresses.[35]

In Baltimore, tree mortality patterns differ with land uses. Site invaders such as tree of heaven, white mulberry, and box elder dominate transportation corridors and industrial and commercial sites and have a high mortality rate. Medium to low-density residential property is the only land use with a higher value in the mature age class, than the young and "over mature" size class distribution, with a ratio of 37:50:13. This distribution reflects a pattern of better growing conditions.

Currently, the Forestry Division plants 2,000 trees per year which, according to the city arborist, is fewer trees than the dead or dying trees it removes annually. There is no comprehensive street tree inventory to strategically manage Baltimore's street trees, including monitoring age distribution and mortality. While reference is often made to the presence of 300,000 street trees, this number appears to fall more into the category of "urban legend" than a reality. In 1959 a "census of public trees on highways" counted 68,614 trees.

There is also no staffing, hardware or software capability to manage a street tree inventory using a tree management software program. There is no program to monitor planting on private property, expect for the remote sensing that was recently performed through IKONOS data.

3. Species Mix

Sustainability Objectives
Provide a diversity of species to promote health of the urban forest, avoiding the risks associated with species-specific pests, and the risk associated with unusual weather patterns. Provide a city-wide assessment of species mix.

Recommendations proscribed for species diversity range from no more than 5percent to 10percent of same species should be planted in a street tree population and from 10percent to 20percent percent the same genera.[36] More recently others suggest that street tree diversity should relate to the range of conditions and objectives in a community, rather than simple numerical standards and that species adaptation to local conditions is more critical than

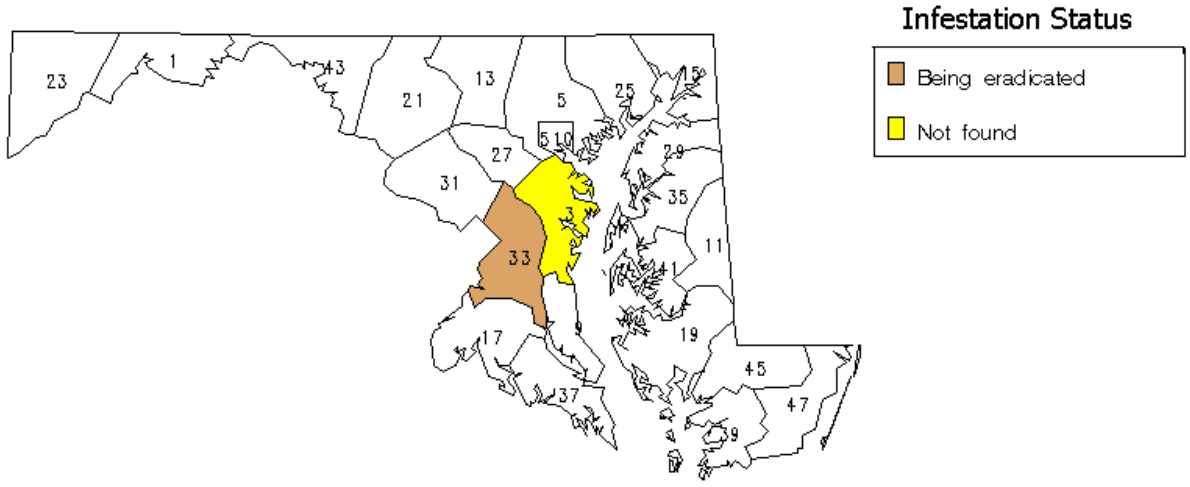
[35] Urban, J. 1989. Cited in Galvin, 1999.. A methodology for assessing and managing biodiversity in street tree populations: a case study, Journal of Arboriculture 25(3).
[36] Cited in Raupp, M. et al. 2006. Street tree diversity in eastern North America and its potential for tree loss to exotic borers. *Journal of Arboriculture and Urban Forestry* 32(6):297-304.

diversity per se. Simple percentage limits on species do not safeguard a population from poor species choices. Manage the resource with local criteria that has been developed with field data that monitors local stresses and species successes and failures.

Challenges

In the last decade, two important pests have been introduced to the United States and are a threat to the urban forest—the Asian longhorned beetle and the emerald ash borer. Currently, the US Department of Agriculture is implementing quarantine and control strategies in New York, Illinois, and New Jersey that seek to eradicate the Asian Longhorned Beetle, a serious pest introduced from Asia. Prince Georges County, Maryland is under quarantine for the emerald ash borer (Figure 10). A recent study of 12 cities in the United States estimated that over 50 percent of the street tree population could be lost to an infestation of these pests.[37] The Asian longhorned beetle has a range of hosts. The emerald ash borer, however, is selective to ash only as a host.

Figure 9
Reported Status of Emerald Ash Borer in Maryland
(1/01/2006-9/22/2006)



http://ceris.purdue.edu/napis/pests/barkb/imap/eabmd.html

[37] Cited in Raupp, M. et al. 2006. Street tree diversity in eastern North America and its potential for tree loss to exotic borers. *Journal of Arboriculture and Urban Forestry* 32(6):297-304.

The emerald ash borer is responsible for the destruction of some 25 million ash trees in Michigan, Indiana, Ohio and Illinois where it has become established. Ash is the most common tree in Baltimore City's urban forest, making up about 10 percent of total trees. Many of these trees are young volunteer trees in open areas. Ash accounts for over three percent of trees in naturally wooded areas in Baltimore and surrounding counties. USDA has estimated that losses could reach almost $300 million in the Baltimore area alone. The emerald ash borer threatens to kill all ash trees in Maryland and ultimately the United States if not stopped. Maryland is the farthest, and only non-contiguous, of the infested states.[38]

Baltimore also has a range of hosts for the Asian longhorned beetle, especially maples (See **APPENDIX D** for a list of hosts). Maples make up over 10 percent of the total urban forest today and represented 45 percent of the street trees sampled in 1980.

Asian longhorned beetle infestation in Chicago: before cleanup[39]

Asian long horned beetle infestation in Chicago: after cleanup.

A 1980 sampling of 1,500 street trees city-wide showed that species diversity violated, or came close to, the 10:20:30 rule in the following species and genera:[40]

Norway maple (including cultivars)	18percent
Red maple:	16percent
Sycamore	9percent
Acer sp.	44percent

Silver maple, a large tree that has proven to be a management headache due to it's brittle wood and spreading habit, was also widely planted and represented 6 percent of the street trees sampled in 1980.

We do not know how this species list relates to current street tree conditions, especially considering that only one third of trees in Baltimore live longer than 15 years.

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[38] Maryland Department of Agriculture. 2007. News release, Removal to Eradicate the Emerald Ash Borer is Underway in Brandywine/Clinton-Area Forests. http://www.mda.state.md.us/article.php?i=4875

[39] http://www.ars.usda.gov/is/AR/archive/jun00/asian0600.htm

[40] 1980 survey data by Davey Tree Company available in hard copy only at Baltimore City Forestry Division.

Currently, the only species or genus to come close to violating the 10-20-30 rule in Baltimore's total urban forest (i.e. not just street trees) is ash, which occurs at a frequency of over 10 percent[41]. There is no data about current species distribution for the city's street trees.

In the last two planting seasons, street tree planting practices included about 5 percent white and green ash, 15 percent maple genus (no silver maples) and 15-20 percent oak genus. Current efforts to plant more oaks are in recognition that oaks have historically been under-represented in the street tree population (3 percent in 1980), especially considering their dominance in the indigenous forest of Baltimore.

While the '10-20-30' rule of thumb for species, genera, and family diversity[42] can be useful as a quick reference for species diversity, the rule is sometimes called into question[43] and other local variables should always be factored in regards to species survivability, and local conditions.

4. Native Vegetation

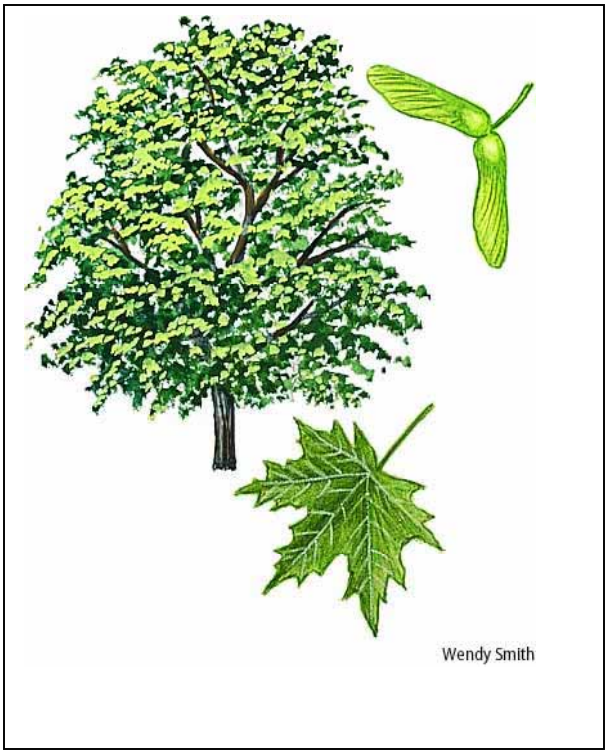
Sustainability Objectives
Maintain the biological integrity of native remnant forests. Do not plant invasive exotic species and engage in an active control program to eliminate and control exotic invasive plants. Require the use of natives on a project-appropriate basis.

Challenges
Baltimore's native remnant forests are threatened by exotic invasive species at all structural levels (see **APPENDIX A** for a list of unpublished reports at the Department of Recreation and Parks on our park forests). In addition, lawn areas that are released from mowing and allowed to grow are often dominated by exotics such as tree-of-heaven, and mile-a-minute weed, which may prevent or delay native forest species from colonizing the site. Norway maple, an exotic invasive plant, has been widely planted as a street and landscape tree. It is no longer planted by the Forestry Division and is not on the Division's accepted tree species list, though it was planted as recently as 2003 by the Division.

[41] UFORE summary data does not distinguish between white and green ash.
[42] Santamour, Frank s. Jr. 1990. Trees for Urban Planting: Diversity, Uniformity and Common Sense. Proc. 7th Conf. Metropolitan Tree Improvement Alliance (METRIA) 7:57-65.
[43] Raupp, et al. 2006.

Due to its invasive quality through prolific seed production, the tree is now ubiquitous in stands of Baltimore's remnant forests.[44] Norway maple, native to Scandinavia may be the single greatest threat to our existing remnant forests because of it's ability to invade and persist in existing forest stands displacing other native species. [45,46]. Not only do trees provide a prolific source of seeds, but also the plant is extremely shade tolerant and so out-competes many of the other understory plants. While Norway maple represents only 1 percent of the urban forest species city-wide, it is a greater threat to remnant forests than the invasive exotic Tree-of-heaven, for example, (5 percent frequency city-wide) because tree-of-heaven does not tolerate shady conditions and thereby cannot thrive in the forest floor. New York's Central Park has had some success in restoring park forests that are threatened by Norway Maple.

Figure 10
Norway Maple



The Office of Park Conservation and Community Outreach performs some educational programs and organizes volunteers to manage exotics in park lands under its Urban Weed Warriors Program. The program's practical value at the current staffing level (one staff person who is grant-funded) is limited to education and constituency- building. The capacity is insufficient for managing the resource at a meaningful level for restoration objectives.

[44] A city-wide street tree sampling of 1,500 trees performed in 1980, showed nearly one in five street trees were Norway maple.
[45] Webb, S. 2000. The Myth of the Resilient Forest: Case Study of the Invasive Norway Maple. Rhodora, Vol. 102, No. 911, pp 332-354.
[46] http://www.dcnr.state.pa.us/forestry/invasivetutorial/norway_maple.htm

CRITERIA FOR BALTIMORE'S COMMUNITY FRAMEWORK

A sustainable forest is one in which all parts of the community share a vision for their forest and act to realize that vision through specific goals and objectives in neighborhoods, public spaces, and private lands.

1. Public Agency Cooperation

Sustainability Objective

Insure that all city departments operate with common goals and objectives regarding the city's trees. Establish informal and formal working teams with staff coordination.

Challenges

Several city departments have on-going activities that effect trees and each agency has their unique perspective depending on the agency's mission. There is a lack of oversight on many of these activities that would provide for a more cohesive approach to protecting and enhancing the tree population in Baltimore.

Currently, the Baltimore City Code does not articulate the intent of a comprehensive forest management program. As a result, tree protection, management, and care programs are scattered throughout city agencies without a clear directive about the importance of trees to the community.

Forestry Division,
Department of Recreation and Parks

Only the Forestry Division of the Department of Recreation and Parks has a mission central to tree management and employs the services of professional arborists and certified tree care experts. According to city code, however, the mission of the Forestry Division is limited to *managing* a public tree program within street right of way, parks and other public lands, not enforcing regulations. As a result, the Forestry Division has limited impact on other issues such as tree protection violations, development practices, or developing comprehensive policies that affect trees throughout the city.

Office of Park Conservation & Community Outreach,
Department of Recreation and Parks

The PCCO office works to educate the public on the urban forest through various education and training programs. PCCO's programs foster community involvement in conserving and caring for the urban-forested parklands by informing the community about the benefits of a healthy urban forest and recommending the use of best management practices. The three programs include: Community Forestry, Forest Enhancement Program, Tree Steward Program, Community Outreach, and Urban Weed Warriors.

Department of Transportation

According to city code, regulation and enforcement of the protection of public trees is under the jurisdiction of the Department of Transportation whose mission is "to provide a comprehensive and modern transportation system that integrates all modes of travel and provides mobility and accessibility in a convenient, safe and cost-effective manner." For all practical purposes, the Department of Transportation does not work in the capacity to regulate or protect public trees. There also is no policy or requirement to replace public trees that are removed as part of road construction or reconstruction.

Sidewalk repair by the Department of Transportation, Engineering and Construction Division, has a major impact on existing trees due to the amount of work performed—250,000 square feet of sidewalk per year. This quantity represents less than ½ percent of the total sidewalks in Baltimore. Root disturbance of trees during sidewalk repair around existing trees often results in significant root damage that causes tree decline and premature death of the tree. Specifications are governed by *The City of Baltimore Department of Public Works Specifications for Materials, Highways, Bridges, Utilities and Incidental Structures, 2006; DPW and DOT Bureau of Highway Engineering, Manual of Design Procedure and Criteria, 1972; and the City of Baltimore Book of Standards.*

The Department of Transportation administers the design and (re)construction of public road projects, where roadside tree planting opportunities may be available or could be created. Prior to design, roadway projects are submitted first to the Department of Planning, Capital Improvement Planning Section for funding. Currently, there are no over-arching policies that work to maximize tree-planting opportunities, enhance the tree-growing environment, or update standards for enhanced tree survival.

Road projects pay a fee in lieu of stormwater management requirements to treat 20 percent of project runoff. New tree planting environments or vegetated best management practices are not currently used to satisfy requirements, though increasing impervious surface is an allowed storm water management practice. DOT does not have staff, expertise, mission, or budget to explore road projects for their potential to increase tree-planting opportunities. Traffic calming projects are currently funded and managed on a very limited basis and landscaping is not a priority. There is potential to meet multiple community goals as well as create new tree planting areas through the incorporation of traffic calming "bump outs" and other devices.

Department of Planning

There are two programs administered by the Department of Planning that provide some tree protection and planting requirements during significant land development projects: the Critical Area Zoning Overlay District and Forest Conservation. Typically, plans are not routed to the Forestry Division for review on public or private land for these development projects, though staff in the Park Conservation and Community Outreach are involved where there is development on park land.

- *Chesapeake Bay Critical Area Management Program*
  The goals of the Critical Area Management Program are to enhance habitat and to improve water quality by reducing pollutant runoff. Any use of the Critical Area Offset Fees must meet these goals. Development within 1000 feet of the Bay and tidally effected water—the Critical Area--are subject to special environmental requirements. When developers cannot meet these requirements, as a last resort, an offset fee is accepted.

  There are 2 types of offset fees: the buffer offset fee which is for improving habitat through the planting of trees, shrubs and other vegetation; and the stormwater offset fee which is for improving water quality by reducing runoff. The stormwater offset fees are used almost exclusively for the removal of impervious surfaces, and most frequently by City Agencies. According to regulation:

  Before a developer is permitted to pay offset fees, the City requires the developer to review the many methodologies for reducing environmental impacts. Alternative strategies for water quality and habitat enhancement shall be incorporated into the developer's project to comply with the 2000 Maryland Stormwater Design Manual (Volumes I and II) and the 10percent Pollutant Reduction Requirement (10percent Rule).

  --Baltimore City Critical Area Management Program Manual:

  Organizations may apply for funding from the Critical Area Offset Fee Program for tree planting and other projects that are located in the city public land including right of way. The process begins by submitting an application to the Department of Planning. The application can be found online at: http://baltimorecity.gov/government/planning/images/Formfor$ProjectsI.pdf

  The Department of Planning reviews the application and if the project is accepted, works with the applicant to further develop and refine the proposal. The revised proposal is sent to the Critical Area Commission in Annapolis for final approval of funding.

  There are currently no funding cycles; the initial application can be submitted at anytime. However, the process can take several months and approval for funding is not assured. Call 410 396-PLAN.

- *Forest Conservation*
  The Forest Conservation Program is mandated by State regulation and is designed to preserve and enhance forests and is currently triggered by development where the disturbance is over 20,000 square feet. The main exemptions to Forest Conservation are properties in the Critical Area, which are subject instead to the Critical Area Management Program.

  To comply with Forest Conservation regulations, a licensed, qualified professional first prepares a Forest Stand Delineation and inventories the existing natural resources

on the site—such as trees, forests, slopes, soils, and identifies priority preservation areas. The applicant then submits a forest conservation plan that proposes preservation of the priority areas. Depending on use, 15–20percent of a site must be retained as forest, protected in perpetuity. As additional mitigation for the development, trees may have to be planted according to a formula that factors in requirements both for replacing forest that is removed, and planting new forest where it did not previously exist.

In some circumstances, the applicant may meet program requirements by retaining forest on site with a conservation easement. Often, however, the development is in a heavily urbanized area, and the requirements are met by planting landscape trees, by a combination of forest retention and landscaping, or by planting trees on another site in the city. As a last resort, when all other options have been exhausted, a fee in lieu may be accepted and placed in a Forest Conservation Fund. The strategies, methods and mechanisms for protecting trees and forests during construction are detailed in the State Forest Conservation Technical Manual.

Currently, by informal agreement, the Forest Conservation Fund is used solely by the Recreation & Parks Office of Park Conservation and Community Outreach for purchasing trees. Residents, community groups, and others may work with, and request trees from, the Office of Park Conservation and Community Outreach by calling 410 396-0339.

According to city code, enforcement for Forest Conservation is under the jurisdiction of the Housing Department Building Officials under their inspection program. However, there are no inspectors assigned to this function. Unlike building code violations, planners at the Department of Planning must inform the Housing Office of non-compliance and generally permits are held as a tool for enforcement, though penalties are provided for in the code. There is insufficient staff for enforcement.

The major limitations of the programs administered by the Department of for tree protection and planting are the disturbance triggers that start at 10,000 Square feet for the Critical Area program and 20,000 square feet outside of for Forest Conservation.

- *Proposed Landscape Ordinance*
  The Department of Planning is currently working on a proposed landscape ordinance. The Ordinance and Manual will be designed to integrate trees, gardens and other landscape elements into the built environment. The objectives are to:
  - Improve environmental quality
  - Preserve and enhance the City's urban character and sense of place.
  - Contribute to the stability of existing and proposed neighborhood development
  - Enhance neighborhood security, and
  - Foster the economic vitality of commercial development.
  - Additionally, stormwater management shall be integrated into landscape areas wherever feasible.

All commercial and most residential development will trigger the landscape ordinance. Preservation and planting will be part of the standards for the proposed landscape manual. Preserving existing trees, especially older trees, and other landscaping will be a high priority. Planting requirements will depend on site design, use, and the relationship of the development to the surrounding neighborhood. Screens, buffers and transitions will be required between incompatible and less than compatible uses. Planting will be required along circulation routes, adjoining streets, over parking lots and in other areas.

Office Capital Projects and Planning, Department of Recreation and Parks

On park property, the Capital Projects Division of the Department of Recreation and Parks applies for building permits without the overview of the Forestry Division. Depending on the project, if they do not trigger the Critical Area or Forest Conservation Act, park projects may acquire a permit directly from the Office of Plans Review in the Housing Department, with no oversight of the Department of Planning.

Department of Public Works, Water Quality Section

The Department of Public Works Water Quality Section is responsible for implementing Baltimore City's NPDES[47] Municipal Separate Storm Sewer permit (MS4). One of the major requirements of the permit (MS4) is to control runoff from 10 percent of the City's impervious area every 5 year permit cycle and the measures used must be incorporated in a watershed plan.

Non-structural measures such as planting trees can be used as "credit" if administrators demonstrate equivalent levels of water quality treatment, however there are some practical limitations in its application. The program currently is investigating how researchers might develop a model to quantify water quality impacts of trees in order to use trees for permit compliance. As a practice, the MS4 program adds trees and other non-structural measures to augment and embellish structural measures, such as in-stream restoration, in order to incorporate multiple benefits. However, applying a methodology to quantify water quality benefits from tree planting might increase resources available for planting.

Department of Housing

The Housing Department, working with the Department of Planning, lets requests for proposals (RFP) on vacant properties for residential or mixed use properties. Currently they have no environmental criteria such as tree planting in the RFP. The housing department also maintains trees on their properties (see chapter 2).

[47] National Pollution Discharge Elimination System

2. Involvement of large private institutional landholders

Sustainability Objective
Engender community-wide understanding and valuing of the urban forest so that large institutional landholders embrace citywide goals and develop specific resource management plans.

Challenges
Institutional landholders in Baltimore make up about 6 percent of the city's tree canopy. Over one quarter of their land holdings are in grass, which is over 1,000 acres in potential forest. Currently, there is no program to encourage these property holders to manage their tree resource and increase canopy.

3. Green industry cooperation

Sustainability Objective
Support each segment of the green industry for city-wide goals and objectives and insure they operate with high professional standards.

Challenges
Currently there is no formal working relationship with industry towards forest management goals in Baltimore City. Maryland has a tree Expert License which is required for all people doing tree care and removal for hire.

4. Neighborhood action

Sustainability Criteria
At the neighborhood level, citizens understand and participate in urban forest management.

Challenges
The Department of Recreation and Parks Tree Steward and Community Forestry programs are functioning under-capacity to engage the participation of all communities or to perform community organizing and follow-through. Four watershed organizations, friends of parks groups, Parks and People Foundation, and the Baltimore City Forestry Board function throughout the city at various levels of capacity. Significant capacity building is needed to involve more citizens city-wide. **APPENDIX E** lists partnering organizations and their activities.

5. Citizen-government-business interaction

Sustainability Objective
All constituencies in the community interact for the benefit of the urban forest.

Challenges
Currently there is no formal structure for citizen-government-business interaction to coordinate all constituencies towards a common goal.

6. General awareness of trees as community resource

Sustainability Objective
The general public understands the value of trees as vital components of economy and environment.

Challenges
Anecdotal information as well as historical and current studies of parts of Baltimore suggest that the public has a variable understanding of the value of Baltimore's tree canopy and that some of these attitudes may vary by neighborhoods.

The Forestry Division receives the full spectrum of complaints from citizens—both pro-tree and anti-tree. Some neighbors want trees removed because of their perceived or real negative impacts to cars, safety, failing sewer lines, and organic litter. Others are impatient for additional tree planting and care in their neighborhoods.

Two neighborhoods illustrate the varied differences in attitude. A legacy of anti-tree sentiments in East Baltimore have been well documented since the 1950's. These attitudes, combined with the challenges of planting in high-density neighborhoods have resulted in many communities in this end of town devoid of trees (Figure 11).

Figure 11
East Baltimore

However, the demographics of part of Baltimore, such as Canton, are changing significantly and some of the newer residents are vocal about their desire for street trees. In addition, the East Baltimore Development, Inc. (EBDI) a non-profit organization is managing the revitalization of an 80-acre portion of East Baltimore with partners including City o f Baltimore, the State of Maryland, and a number of local civic groups and charitable Foundations. More and healthier trees are part of the vision for EBDI (Figure 12).

Figure 12
Eager Street Proposals, East Baltimore Development, Inc.

Existing Conditions **Proposed Conditions**

Urban Design Associates[48]

Bolton Hill, on the other hand, has a long tradition of valuing their trees, and as a result, their street tree population remains relatively stable. The urban forestry research community has a keen interest in identifying the linkage between social variables and attitudes towards urban vegetation.[49]

7. Regional cooperation

Sustainability Objective
Provide for cooperation and interaction among regional planning groups.

Challenges
Federal and State agencies such as the USDA Forest Service and Maryland Department of Natural Resources increasingly are focusing on the urban forest, and Baltimore's ecosystem specifically, as a place to invest staff time and grant resources. Partners of the Baltimore Ecosystem Study and Revitalizing Baltimore worked to develop the Tree Canopy Goal with officials of the Department of Recreation and Parks. With the advent of the Urban Forest Management Plan, these relationships promise to grow stronger over time. There is also potential to increase cooperation and engagement with the policies and programs of Baltimore County.

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[48] Consultants to East Baltimore Development Inc., The East Baltimore Comprehensive Redevelopment Plan
http://www.urbandesignassociates.com/project42_transformation.html

[49] Grove, J.M. et al. 2006. Characterization of households and its implications for the vegetation of urban ecosystems.

Revitalizing Baltimore, a regional partnership to strength community-based efforts to improve urban natural resources, is supported by the USDA Forest Service and managed by the Parks & People Foundation in cooperation with the Maryland State Forester of the Department of Natural Resources[50]. The Urban Resources Initiative is another program of the Parks and People Foundation that coordinates with universities in an internship program to assist urban communities in finding community-based solutions to natural resource management issues. The Baltimore Ecosystem Study conducts research on metropolitan Baltimore as an ecological system and is funded by the National Science Foundation.[51]

BES strives to contribute to making Baltimore "a model center for environmental quality and ecological literacy". BES seeks to develop relationships with local, county, and state government, natural resource managers, and community leaders in Baltimore, to coordinate research and share data in a way that meets the needs of professionals and volunteers engaged in managing and restoring the natural environment in the Baltimore region. Through the Urban Resources Initiative, Parks & People Foundation receives BES funding for staff to oversee interactions at the local level with communities, decision makers, and agencies in the Baltimore Metropolitan area.

While Baltimore City has benefited by the presence of these initiatives, investigations and activities that help the Department of Recreation and Parks achieve environmental goals through their on-going activities have been limited. Transferring some of the knowledge in order to influence practices of local government and in helping increase the capacity of agencies is a challenge. Programs such as Baltimore Ecosystem Study and Revitalizing Baltimore often have interests, goals and objectives that do easily apply to the operational or programmatic needs of the Department of Recreation and Parks and so developing positive working relationships between the two organizations is challenging. Both organizations are working towards a stronger collaboration.

[50] http://parksandpeople.org/programs_revit_balt.html

[51] The Baltimore Ecosystem Study (BES). The program integrates biological, physical, and social sciences. As a part of the National Science Foundation's Long-Term Ecological Research Network, BES seeks to understand how Baltimore's ecosystems change over time. The ecological knowledge created by BES supports educational and community-based activities, and interactions with the Baltimore community. http://www.beslter.org/index.html

CRITERIA FOR RESOURCE MANAGEMENT

Both the philosophies as well as the pragmatics of management are important. Acceptance of a comprehensive management plan and funding program by city government and its constituents allows for a shared vision.

1. City-wide Management Plan

Sustainability objective

Develop and implement a management plan for trees and forests on public and private property.

Challenges

This Urban Forest Management Plan fulfills the planning part. The entire civic community will be needed for implementation.

2. City-wide funding and staffing

Sustainability objective

Develop and maintain adequate funding to implement a city-wide management plan.

Challenges

The declining urban forest suggests that the Forestry Division is currently under-funded. The absence of a current street tree inventory makes it difficult to assess the necessary resources. The agency is operating with old equipment (**APPENDIX F**), inadequate staffing, insufficient skill levels and a deficiency in data and information systems.

Forestry practices vary widely from city to city. In order to provide a frame of reference for the financial commitment of the City of Baltimore to the care of the urban forest, the overall expenditure of 8 cities with urban forestry programs in the east coast and Midwest is presented here. Population of the cities ranges from about 234,000 in Norfolk to 8 million in New York City (Table 5).

Table 5
Land Area and Population of Study Sites

City	Population (2000)	Land Area (sq. mi.)
New York	8,008,000	301
Chicago	2,784,000	229
Philadelphia	1,517,000	135
Baltimore	651,000	(Land area) 80
Boston	589,000	90
Milwaukee	597,000	96
Minneapolis	383,000	59
Norfolk	234,000	66

Funding Sources

The cities studied use a variety of funding sources, but the most common is general funds (**Table 6**). Baltimore's Forestry Division is allotted no general funds. The Division is funded entirely with Motor Vehicle Revenues and a small amount of funding, on a year-to-year basis, is provided by the city's Critical Area Offset fund and Forest Conservation Offset fund.

Table 6

Sources of urban forestry budgets by city

City	General Fund	Grants	Tax Levy	Capital Bond	Motor Vehicle Revenue
Baltimore[a]		X			X
Boston [b]	X				
Chicago [b]	X				
Milwaukee [b]	X	X	X	X ($1m.)	
Minneapolis[c]	X		X (8 % local levy)		
New York [b]	X	X		X	
Norfolk [b]	X				
Philadelphia [b]	X				

[a] *Baltimore City Forestry Division, 2006*
[b] *USDA Forest Service, 2006*[52]
[c] Minneapolis Park Board, 2006[53]

[52] Cumming, Anne, 2006, Support of urban forestry programs: results from selected cities, USDA Forest Service, unpublished report

[53] Minneapolis Park Board, Your taxes at work, http://www.minneapolisparks.org/default.asp?PageID=139

Annual Budget

In fiscal year 2005, Baltimore City Forestry Division received a $1 million dollar increase to their annual budget—35percent of the year's previous budget—to $3.8 million dollars (Table 7). With this increase, Baltimore now ranks 6th in total budget and moved from 6th to 5th ranking in both dollars per capita and dollars per acre (Tables 8 and 9). When factoring in per capita and per square miles, Minnesota and Milwaukee consistently rank first and second and Boston consistently ranks last.

Table 7
Ranking of urban forestry budget by city

Rank	City	Urban Forestry Budget
1	Chicago	$15,000,000[a]
2	New York	$14,000,000[a]
3	Philadelphia	$13,700,000[a]
4	Milwaukee	$10,900,000[a]
5	Minneapolis	$ 9,206,044[b]
6	Baltimore	$3,800,000[c]
7	Norfolk	$1,400,000[a]
8	Boston	$920,000[a]

[a] *USDA Forest Service*[54]
[b] *Minneapolis Park Board*[55]
[c] *Baltimore City Forestry Division, 2007*

Table 8
Amount spent on urban forestry per capita

Rank	City	Urban Forestry Budget per Capita
1	Minneapolis	$24.06
2	Milwaukee	$18.46
3	Philadelphia	$9.17
4	Norfolk	$6.01
5	Baltimore	$ 5.84*
6	Chicago	$5.18
7	New York	$1.75
8	Boston	$1.56

*2006 funding level, after $1m budget increase

Table 9
Amount spent per area of city

Rank	City	Urban Forestry Budget Per sq. mi.
1	Minneapolis	$156,034
2	Milwaukee	$113,541
3	Philadelphia	$101,481
4	Chicago	$65,521
5	Baltimore	$ 46,914*
6	New York	$46,511
7	Norfolk	$21,212
8	Boston	$10,222

*2006 funding level, after $1m budget increase

[54] Cumming, Anne, 2006, Support of urban forestry programs: results from selected cities, USDA Forest Service, unpublished report

[55] Minneapolis Park Board, Your taxes at work, http://www.minneapolisparks.org/default.asp?PageID=139

3. City staffing

Sustainability objective
Employ and train certified arborists and professional tree care staff to implement city-wide management plan.

Challenges
The staffing for cities across the country is variable and most of the cities also use contractors. It is difficult to compare staffing practices across cities without further information about the role of contractors.

Baltimore has 40 employees and three of these positions require a International Society of Arborists certification, including City Arborist, the Assistant City Arborist, and the Forestry Specialist. Baltimore hires nine 4-member crews for tree pruning and these companies are required to have a Maryland tree care license.

Table 10
Staffing Levels

City	Department Title	Number of Employees	Sq. miles per Employee
Chicago	Streets and Sanitation, Bureau of Forestry	225	1.02
New York	Department of Parks and Recreation	200	1.5
Milwaukee	Public Works	200 Permanent, 45 Seasonal/Temp	0.5 permanent
Philadelphia	Fairmount Park Commission	40	3.38
Baltimore	Bureau of Parks Forestry Division	40	2.0
Norfolk	Division of Parks and Urban Forestry	22	3.0
Boston	Parks and Recreation	4	2.25
Minneapolis	Park and Recreation Board, Operations Division, Forestry Section		

4. Assessment tools

Sustainability objective
Develop methods to collect information about the urban forest on a routine basis. Provide a city-wide tree inventory and integrate it into a Geographic Information (GIS) based management system.

Challenges
Baltimore does not have a comprehensive city-wide tree inventory. Groups throughout the city have collected disparate information in a good-faith effort to collect information to manage the trees. The Baltimore City Forestry Division does not have the capacity to integrate a comprehensive tree inventory into a management system, however.

The Forestry Division's work is driven by citizen requests that are maintained through a citizen service request (CSR) data base. This system confounds the agency's efforts to program their work in an efficient manner to enhance overall tree health. Prior to the infusion of a significant budget increase to hire contractors, the agency had a consistent and growing backlog of 9,000 service requests. This backlog has been reduced to 2-3,000. However, the outcome which is measured by the number of opened citizen service requests, is not an accurate measure of how the resource is being managed, nor is it a good measure of efficiency, since complaints continue to drive the work.

Many cities prioritize their work on a service-area basis, rather than in response to individual requests for service as part of a tree maintenance plan in order to reduce maintenance costs and enhance overall tree health.[56] Frequently, urban forest managers will integrate maintenance needs with strategic activities based on long-term goals. Inventories serve as the basis for plan objectives.[57]

5. Protection of existing trees

Sustainability objectives

Conserve existing tree resources, planted and natural, to insure maximum function. Provide an integrated planning program for conservation and development including the development and enforcement of a tree preservation ordinance; require tree preservation plan for all projects, public, private, commercial, residential.

Challenges

The regulation of public trees is through the city's tree ordinance that dates from 1812 and regulatory authority lies with the Department of Transportation. The ordinance needs updating to include a stated intent of managing a sustainable urban forest and meet current goals and standards of contemporary urban forestry practice (it is still illegal to hitch a horse to a tree, however). Enforcement is inadequate.

Tree preservation plans are required only for significant development under two regulatory programs: the Critical Area Overlay District and the Forest Conservation program. There are no provisions for protecting private trees on private property where site disturbance is less than 10,000 square feet, except within 100 feet of mean high tide of the harbor and tidal tributaries.

6. Species and site selection

Sustainability objectives

Provide guidelines and specifications for species use including a mechanism to evaluate the site to ensure high performing species with good site-species match.

[56] Cabrera. Gabe. 2001. A Survey of municipal tree programs. City and County of San Francisco, Board of Supervisors, http://www.ci.sf.ca.us/site/uploadedfiles/bdsupvrs/leganalyst/021-00_Treepercent20_Programs.pdf
[57] Cumming, A.B. 2005 unpublished report. Support of urban forestry programs: results from selected cities.

Challenges
The city arborist orders trees with known performance in the trade and the Forestry Division website has a recommended trees list. The Division does not purchase exotic invasive plants. However, there is no formal on-going program to evaluate species adaptability to specific local conditions.[58] The Critical Area Management Program provides a recommended plant list. The Critical Area program manual includes some plants that are exotic invasive species.

7. Standards for tree care

Sustainability objectives
Adopt and adhere to professional tree care standards community-wide.

Challenges
The city arborist follows the industry standards—American National Standards (ANSI). The degree to which these standards are met is limited by equipment and staffing. Educational efforts by the Office of Park Conservation and Community Outreach fosters proper tree care within the community, but is operating at a small capacity to influence change.

8. Standards for tree care

Sustainability Objective
Maximize public safety with respect to trees by implementing a comprehensive hazard program that identifies hazard trees in regard to pruning needs and tripping hazards.

Challenges
Currently the Forestry Division responds to citizen requests only in addressing hazard trees. A pruning schedule is designed, but is not yet implemented because the recently created pruning coordinator position (an annual contractual position) is vacant.

9. Recycling

Sustainability Objective
Create a closed system for tree waste where no material enters the waste stream.

Challenges

The Forestry Division removes several thousand trees annually and delivers them to Camp Small[59], a seven acre lot next to I-83 and the Jones Falls Stream. Up until the early 1980's

[58] The Critical Area Management Program protects vegetation in the "Buffer"--within 100 feet of high tide.

[59] Camp Melvale, was a Civil War camp that existed from 1861 to 1862 at Cold Spring Lane and Jones Falls in the Cross Keys area. Camp Melvale was also called Camp Small because George W. Small had previously owned the property. Jim,

the city used a tub-grinder to dispose of the material on-site and use it in horticultural activities throughout the community. When the equipment exhausted its useful life, it was not replaced. Since that time logs have been stockpiled at Camp Small. In addition, mulch from chipper trucks and leaves from city-wide collection are also stored there. In the early 1990's a contractor cleared the area of logs at a cost of $400,000 and the contractor removed all the material. The City does not have an on-going management plan for recycling tree waste. The Forestry Division for more than a decade has for many years been advocating for the purchase of a tub-grinder.

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an office worker at Fleischmann's, said that the area west of the Fleischmann building was the site of Camp Small during the Civil War. It was used as a holding area for prisoners. http://ron.spath.com/anton93.html

Chapter 4: Recommendations

Chapter 3 identified Baltimore's challenges in developing a sustainable urban forest. Overcoming these challenges will be most influenced by policies that result in:

1. Interagency cooperation supporting the tree canopy goal;
2. Managing public lands for a sustainable urban forest;
3. An integrated regulatory framework for comprehensive urban forest management on public and private properties;
4. Urban infrastructure designed and built to maximize nurturing tree-growing environments while minimizing conflicts with trees;
5. Tree species best suited to their growing environment, that do not threaten other plant communities, and are well cared for;
6. Protecting existing trees;
7. Increasing tree planting on private lands through a variety of incentive programs;
8. Building capacity for tree planting and care through promotion and by the partnering with public and private organizations and sponsors.

Policies, objectives, and associated tasks are outlined below, identifying agency responsibility, needed resources within three time-frames: Short-term, 1-2 years; M, 3-5 years; and long-term.

Key to Abbreviations

Agencies

BSS	Baltimore City Public School System
CS	Corporate Sponsor
DOP	Department of Planning
DPW	Department of Public Works
DOT	Department of Transportation
DRP	Department of Recreation and Parks
FD	Forestry Division
FOP	Friends of Parks
HCD	Department of Housing and Community Development
IT	Information Technology
LW	Law Department
MO	
ON	Office of Neighborhoods
P&P	Parks and People
PCC	Office of Parks Conservation and Community Outreach
WO	Watershed Organizations
M	Mid-term, 3-5 years

Timeframe

S	Short-term, 1-2 years
M	Mid-term, 3-5 years
L	Long-term, greater than 5 years
O	On-going

POLICY: INTERAGENCY COOPERATION THAT SUPPORTS THE TREE CANOPY GOAL

Objective 1: Develop a management system to facilitate implementation of the Urban Forest Management Plan

Task	New Resources	Agencies/ Time frame	
At the direction of the Mayors Office and the Director of Recreation and Parks, establish an inter-agency working group to implement the Urban Forest Management Plan.	(1) TreeBaltimore Coordinator	FD DOP DPW DOT	S O
Establish a position at the Recreation and Parks or Department of Planning to coordinate the activities of the working group. Meet quarterly to direct the work program and direct staff to implement tasks on a project basis.	(1) TreeBaltimore Coordinator	DRP	S M
Some tasks may include: ▪ Input into the pending Landscape manual ▪ Revisions to Baltimore Book of Standards ▪ Policies for sidewalk repair	(1) TreeBaltimore Coordinator		S M

POLICY: MANAGE PUBLIC TREES AND FORESTS FOR SUSTAINABILITY

Objective: Establish a 5-year plan for street tree management operations according to best practices of the American National Standards A300

Task	New Resources	Agencies/ Time frame	
Assess the current street tree resource of Baltimore City. • Perform a statistically significant city-wide street tree sampling to assess the overall quantity, species diversity, health, and age of Baltimore City's street tree resource. • When the capacity of the Forestry Division can support the work, perform a complete street tree inventory, preferably with consultant services, to use as data to begin a computer-based tree management program.	Funding for consultant services. Forestry Planner to work with DOP to assess the data to be collected by a volunteer survey, Summer, '07.	DOP FD	S O
Integrate a Geographic Information System-based street tree management program into the current operations of the Forestry Division. • Increase capacity of the Forestry Division by providing new positions that require qualifications in the use of forest management software. • Provide tree management hardware and software to the Forestry Division.	(1) Forestry IT technician Hardware and software. IT support	DRP	M
Increase professionalism by providing annual off-site training to all forestry staff that work directly on and plant trees, by Maryland Arborist Association and other organizations.	Increased forestry budget	FD	S

Increase capacity and professionalism of tree inspection. ▪ Divide Tree Service Technician's territories into 4 quadrants. ▪ Require ISA certification or Md. Tree Expert License for all Tree Service Technicians. ▪ Increase number of pick-up trucks to accommodate new technicians.	(3) tree inspectors (3) pick-up trucks	FD	S
For tree pruning, transition from a service request driven system to a pruning cycle program to reduce pruning demand increase efficiency, and reduce tree hazard complaints over time. ▪ Implement 7-year pruning cycle program. (See APPENDIX) ▪ Remove tree pruning from Cititrak option. ▪ Revise citizen service request options on the Cititrak system from "pruning" and "dead tree" to "tree inspection" to allow inspectors to determine proper course of action ▪ Implement young tree pruning program city-wide ▪ Provide bi-annual in-house training in proper pruning technique to staff	(2) Crews: (1) ea. foreman, tree trimmer, & grounds person, Vehicles & equipment; (2) tree service technician & vehicles (1) dedicated person from Tree Steward Program	FD DRP, IT PCC	S
Increase efficiency and professionalism of planting program. ▪ 2 dedicated planting crews during planting season with dedicated equipment. ▪ Call Miss Utility for all planting locations. ▪ Implement watering program for new trees in medians and along parks for first two years, when they are not watered by residents. ▪ Implement fertilization program for trees that are three years in the ground and then again in 5 years. ▪ Provide bi-annual in-house staff training of proper planting technique.	2 pick up trucks, 1 watering tank, 1 dingo Assistance from 311 Dedicated crew of two, May through Oct. Dedicated crew of (2), Nov. – April ¼ dedicated person from Tree Steward Program	FD 311 FD PCC	S
Design and implement a program to recycle wood from tree removal operations. • Compost leaves into mulch for use by agencies and to be made available to citizens at low cost. • Develop partnership with roving sawmill to use choice wood for better purposes such as furniture and lumber.	Tub grinder and (2) heavy equipment operators. Forestry planner to develop plan; Composting facility; Pruning Coordinator	FD DPW	S M L O
Provide bi-annual in-house training in proper tree removal technique to staffers	1 dedicated person from Tree Steward Program	PCC	S
Fully fund stump removal program and schedule removals by zone instead of service request. • Stump removal crew would consist of two people, one to grind stump, one to remove grindings • Divide stump removal areas into three • Remove grindings, add topsoil and seed where removal is in a tree lawn.	Increase staff to provide for three crews	FD	S

Objective2: Assess the current quality and quantity of park forests and trees.

Design and implement a tree and forest inventory. • Create definitions for tree lawn, forest stand, forest fragment • Select inventory tool and develop • Implement inventory • Analyze inventory results	(1) Natural Resources Coordinator	DRP DOP	S M

Objective 3: Develop vegetation management plans for parks to obtain sustainable natural habitat structure and composition.

Using vegetation inventories and analysis, develop goals and objectives. • percent canopy objectives • Stocking levels • Structural objectives • Habitat objectives • Spatial objectives	(1) Natural Resources Coordinator	DRP	S
Develop management plans • Planting plan and schedule to acquire and sustain canopy; • Tree care schedule; • Forest management of ex. Forest stands to sustain habitat objectives • Soil management plan	(1) Natural Resources Coordinator	DRP	S M
Objective 4: Reduce presence of exotic invasive plants throughout City public spaces.			
Based on vegetation management plans, where necessary, develop a plan for exotic invasive removal. • Prioritize work areas by level of threat as well as opportunity or need for rapid intervention. • Develop techniques • Identify staffing needs • Implement plan • Create a handbook of best removal techniques • Evaluate progress and adjust as needed	(1) Forest enhancement coordinator, (1) Horticulture technician; (3) laborers publishing software, funds for printing		S
Objective 5: Direct the actions of organizations and individuals involved in management practices and activities that restore, maintain, and enhance Baltimore City's Urban Tree Canopy.			
Based on management plans, develop prioritized urban canopy projects for each park.	(1)Community forestry coordinator	DRP	M
Work with communities for implementation • Identify communities with an existing, strong volunteer base to implement plans. • Build capacity of other groups by through education and community organizing	(1) Community forestry coordinator	DRP ON P&P WO FOP	S M L

Objective 6: Develop vegetation management/naturalized landscape plans for school sites and direct the actions of organizations and individuals involved in school greening projects that involve trees.

Involve both school administration and facility maintenance staff	(1) Tree steward trainer Outreach materials	BRP BSS	S L
Training facility maintenance staff	Training manual, tools, mulch, water	DRP	S L
Tie vegetation management plans into current curriculum	Tools, mulch, water, handouts	DRP P&P BSS	S L
Integrate outdoor education with volunteer stewardship opportunities	Tools	DRP P&P BSS	S L
Objective 7: Enhance and protect soil resource.			
Extend the size of existing buffers	(1) Community outreach coordinator, Trees, volunteers, tools, water, mulch	DRP DPW WO	M L
Reduce or remove exotic invasive species	volunteers, paid crew, bags, tools	DRP DPW WO CS	S L
Diversify both species composition and age of	Trees, volunteers, tools, water, mulch	DRP DPW WO	S L
Identify potential new riparian buffers	Staff, paid crew	DRP DPW WO	M L
Establish rain gardens on school sites-parking lots	School kids, Staff, tools, volunteers	DRP DPW WO	M L
Continue removing impervious surfaces on school sites.	Contractor	DRP DPW	M L
Objective: Increase the Community forestry activities throughout Baltimore			
Increase community forestry staffing to run expanded programs in: Training communities • Identifying community goals and objectives • Tree care and maintenance • Community tree inventories • Tree Planting • Concrete removal Organizing and supervise communities for in implementing	(4) Tree steward trainers. Classroom and educational materials Promotion Field equipment	DRP	S O
Developing working group to identify roles and responsibilities of partnering organizations and mutually supportive events and activities		DRP P&P WO FP	

POLICY: DESIGN AN INTEGRATED REGULATORY FRAMEWORK FOR THE PROTECTION AND ENHANCEMENT OF THE URBAN FOREST, WHICH REFLECTS CURRENT STANDARDS OF PRACTICE

Objective 1: Establish a goal to upgrade the regulatory framework for the urban forest to reflect professional trends and standards of practice.

Task	**New Resources**	**Agencies/ Time frame**	
At the Direction of the Mayor, the Directors of Recreation and Parks and Planning, upgrade the regulatory framework to be consistent with professional standards recommended by the USDA Forest Service, the National Urban and Community Forestry Council and the International Society of Arboriculture. Use the standards of practice established in *Guidelines for Developing and Evaluating Tree Ordinances*[60] and in conformance with standards outlined in the INFRASTRUCTURE POLICY section of this report. Where there is a conflict, the stricter standard shall apply.	¼ time new staff R&P	DRP DOP LW	S O
Establish a citizen and government advisory committee to oversee revisions to Baltimore's tree regulations		DRP DOP	S

Objective 2: Incorporate into the City Code a clear intent to protect and enhance the urban forest—public and private.

Revise Baltimore City Code, Article 7, Natural Resources, adding "Comprehensive Urban Forest Management (CUFM)," as a Division that articulates the express goals of CUFM. Place related subdivisions, such as an ordinance protecting public trees, Forest Conservation, and a new landscape ordinance within the CUFM Division. (APPENDIX G)	¼ time new staff	DRP DOP LW	S O
Include within the CUFM Division, findings related to the canopy goal and/or sustainable urban forest as well as stated purpose and intent.	¼ time new staff, DRP	DRP DOP LW	S

Objective 3: Revise current city code to strengthen the ability to protect and enhance the urban forest on public lands

Establish a new tree ordinance for the protection & enhancement of the *public* urban forest.	¼ time new staff, DRP	DRP DOP LW	S

Objective 4: City Arborist shall approve all DOT new construction affecting trees.

Require Arborist approval of all streetscape plans as defined in Article 26, Subtitle 10A	time new staff DRP	DRP DOT LW	S

[60] International Society of Arboriculture, 2001, *Guidelines for Developing and Evaluating Tree Ordinances* http://www.isa-arbor.com/pbulications/ordinance.aspx

Objective 5: Protect designated individual trees on private property from indiscriminate removal and damage

Require a permit with oversight by City Arborist to remove or damage: Notable Trees as designated by Baltimore's Notable Tree Program; trees planted or retained to meet the proposed andscape ordinance, Critical Area requirements, or Tree & Forest Conservation; trees over X" in dia, Excepting trees on the List of Invasive Alien Plant Species of VA (APENDIX K)	¼ time new staff DRP	DRP DOP LW	S
City arborist to review all permits for removal or damage to protected trees.	¼ time new staff DRP	DRP DOP LW	S

Objective 6: Incorporate tree planting in new developments consistent with tree canopy goal

Integrate tree planting requirements on private property into Article 7, new CUFM Division, by continuing the on-going design of a new landscape manual in conjunction with revisions to Forest & Tree Conservation (APPENDIX K)	¼ time new staff, DRP	DRP DOP LW	S

Objective 7: Protect designated individual trees and forests on development sites from unnecessary removal and damage

Integrate tree & forest protection requirements on private property into Article 7 by continuing the on-going design of a new landscape manual in conjunction with revisions to Division 4--Forest & Tree Conservation. For smaller development sites that do not trigger Conservation a tree impact plan, performance standards for retaining trees, replacement schedule for trees that are permitted to be removed, tree protection provisions during development, performance bond for tree protection, mitigation for tree loss, other programs acceptable for mitigation such as the restoration of public forests, permit process requirements, tree protection plan to be reviewed by City Arborist and Department of Planning.	¼ staff DRP	DRP DOP LW	S

Objective 8: Provide adequate enforcement for a comprehensive forest management program.

Increase staffing as proposed in the Forestry Division recommendations of this report to allow permit review and enforcement of activities related to public trees, and the review of permits to remove special trees on private land (see objective 7 above).	½ position, DRP	DRP	S
Increase staffing at the Department of Planning and Department of Housing for the enforcement of protection and planting of trees on development sites.	½ time positions	DOP HCD	S

POLICY: BUILD TREE-FRIENDLY URBAN INFRASTRUCTURE

Objective 1 : Incorporate tree standards in all Baltimore City construction and reconstruction projects with best practices for growing roadside trees and trees in highly developed areas while protecting infrastructure.

Task	New Resources	Agencies/ Time frame	
Develop policy whereby city infrastructure shall incorporate tree standards to the best practices and the maximum amount of tree planting opportunities practicable.			S
Develop a committee to coordinate and update the *Baltimore City Book of Standards* (BCBS) with the pending landscape manual to incorporate best practices for constructing infrastructure for tree planting in roadsides and other highly developed areas. Integrate the BCBS, the City of Baltimore DPW Specifications, and the landscape manual so that private development and city projects are governed by the same standards and work together towards the same goal on public and private projects.		DPW DOT DOP DRP	S
Require these revised standards in all Baltimore City contracts.		DPW DOT	
Incorporate trees in all roadway projects to the maximum extent possible based on site constraints. ▪ Ideal spacing of street trees and trees in other hardscape areas shall be 30'. ▪ Depending on site conditions, spacing may range from min. 25' to max. 45' to respond to site constraints.		DPW DOT DOP	
Tree species criteria: ▪ All trees shall be from the latest ed. of the Baltimore City Forestry Division list of recommended trees or approved by the Forestry Division and the Department of Planning. ▪ No trees approved that are on the list of Invasive Alien Plant Species of Virginia http://www.dcr.virginia.gov/natural_heritage/documents/invlist.pdf			
Compaction prevention specifications for street ROW and high density development Low ornamental fence/barrier with ground cover or mulch. No fencing on street side. ▪ Raised monolithic curbs ▪ Grates or blocks in sand allowed only where pedestrian traffic is required over rooting area and at approval of Department of Planning and Forestry Division, with management plan included to specify who is responsible for on-going care.			
Add addendum to City of Baltimore DPW Specifications for materials, 2006, to eliminate exotic invasive plants in list of Invasive Alien Plant Species of Virginia (APPENDIX M)			

POLICY: USE TREE SPECIES BEST SUITED TO THEIR GROWING ENVIRONMENT, THAT DO NOT THREATEN OTHER PLANT COMMUNITIES, AND INSURE THEIR SURVIVAL.

Objective 1: Select species well adapted to the growing environment that do not threaten natural ecosystems.

Task	New Resources	Agencies/ Time frame	
Working with the committee to integrate Baltimore City Book of Standards with the pending Landscape Ordinance, incorporate the plant material standards proposed in this section of the Urban Forest Management Plan. ▪ All trees shall be from the latest ed. of the Forestry Division list of recommended trees or approved by the Forestry Division and the Department of Planning. ▪ No trees approved that are on the list of Invasive Alien Plant Species of Virginia ▪ Add addendum to City of Baltimore DPW Specifications for materials, etc., 2006, to eliminate exotic invasive plants.	½ time project coordinator		S

Objective 2: Use plant sizes appropriate to the environment

Trees in right of way and high density residential and commercial areas: 2-2.5" cal. Min, 3-3 ½" preferred.			S

Objective 3: Insure proper care for trees after planting

Require care of plants by adjoining property owner. ▪ Establish an education program on proper tree care ▪ Inform property owners of their responsibility		DOP DPW DOT FD	S

POLICY: PROTECT EXISTING TREES FROM CONSTRUCTION PRACTICES

Objective 1: Follow best practices in sidewalk repair for survival of mature trees.

Task	New Resources	Agencies/ Time frame	
Develop a sidewalk repair and tree preservation program consistent with the tree canopy goal—preserving as many large, healthy trees as possible, while providing for infrastructure stability, public safety, and ADA accessibility. Consider alternatives to current citizen-request driven system with a comprehensive schedule based on a coordinated city-wide sidewalk damage and tree assessment such as in Los Angeles (**APPENDIX N)**	¼ time coordinator	DOT DPW DOP FD	M
Until comprehensive program is developed, work within ex. system of repair and require an arborist sub-consultant on each sidewalk repair contract administered by DOT as well as development projects that involve existing mature trees. Alternatively, integrate tree assessment within a comprehensive sidewalk repair program.		DOT DPW DOP FD	S
Create a new certified arborist position in Transportation to perform assessments for sidewalk repair.	(1) arborist	DOT FD	M
Involve the community in the sidewalk repair program on a project basis. Inform citizens of ex. and new tree-friendly policies. ▪ Tree pits will not be filled at citizen request		DOP DOT	S
Investigate the feasibility of "grinding" the top of sidewalks as the first choice on sidewalk damage is offset less than 2 inches. (see City of Modesto).		DOT	M
Arborist to grade trees on each sidewalk repair contract on a graded scale of A-F according to the criteria established by Los Angeles sidewalk repair program	(1) arborist		M
Where root pruning is required and determined to be acceptable by the registered arborist, arborist shall prescribe and supervise methods.	(1) arborist		S
Follow-up all root pruning with inspections at 18, 40, and 78 months.	(1) arborist		M
Where professional arborist recommends tree removal instead of root pruning, a tree removal request shall be submitted to the Forestry Division.			M
Forestry Division shall determine replacement rate based on the value of the tree removed at a min. ration of 2:1. Work with community to identify sites where adjoining property owner will welcome and care for the new trees.			M
Replant sites where existing trees cannot be safely retained.		FD	

Objective2: As sidewalks are repaired, modify the sidewalk to improve the growing environment

During sidewalk repair, contractor shall improve both the growing environment for trees and increase opportunities for future planting by revising the sidewalk designs to conform to tree canopy infrastructure standards (see infrastructure policy objectives) to the degree possible. ▪ Enlarge tree wells ▪ Minimize sidewalk width ▪ Obtain additional public easement from property owner ▪ Sidewalk ramping ▪ Flexible sidewalks ▪ Use root deflection devices. ▪ Create curb bump outs.		DOT FD	S
Existing pits shall not be closed. Where citizens request tree pits to be filled in, the Transportation Department will direct the citizen to the Forestry Division to answer questions about why this is against city policy.			S

Objective 3: Protect trees from construction impact on all city and development projects

Include tree protection specifications on all contract drawings applying for a building permit where mature trees (10" dbh and above) exist on site (see regulatory framework).			M
Develop a tree protection field guide modeled after the Minneapolis www.ci.minneapolis.mn.us/cped/docs/field_guide.pdf			

POLICY: INCREASE TREE CANOPY ON PRIVATE PROPERTY THROUGH A VARIETY OF INCENTIVE PROGRAMS

Objective 1 : Develop a market-based incentive program, in order to motivate members of the public to purchase and plant trees on private property.

Task	New Resources	Agency/ Time frame	
Meet with Baltimore County Department of Environmental Protection and Resource Management to investigate opportunities for a joint City/County program modeled after Growing Home Campaign.		DRP DOP	S
Provide staffing (permanent or grant funded) to design and implement program	½ time coordinator & Budget for promotion	DRP	S

Objective 2: Provide a small-tree for individuals to plant trees on private property.

Implement an on-going bi-annual small tree giveaway of trees in 1-2 gallon pots. Residents to pick-up and plant trees at a centralized location.	¼ time coordinator.; Budget for trees & promotion	DRP	S

Objective 3: Provide a community-oriented cost-share program of moderate sized trees to be planted on private properties.

Implement a grant program to promote shade trees on private property directed towards civic organizations such as community organizations, including 50/50 cost share of larger trees. Promote civic groups developing tree committees and being responsible for coordinating the program (**APPENDIX H**)	Non-profits, sponsors	DRP	M

POLICY: BUILD CAPACITY FOR TREE PLANTING AND CARE THROUGH PROMOTION AND PARTNERING WITH PUBLIC AND PRIVATE ORGANIZATIONS AND SPONSORS.

Objective 1 : Develop a marketing program for TreeBaltimore

Task	New Resources	Agencies/ Time frame	
Coordinating with the Office of Media and Marketing and the Forestry Division, develop a comprehensive marketing strategy for TreeBaltimore.	(1) ¾ time coordinator & budget for marketing materials	DRP	S M

Objective 2: Work with public and private organizations to support the tree canopy goal.

At the Direction of the Mayor and the Department of Recreation and Parks, establish a Task force to explore the feasibility of a TreeBaltimore Trust that would fund major activities of TreeBaltimore. ▪ Identify roles and responsibilities of key stakeholders ▪ Identify major corporate sponsors; ▪ Fund major grant program for community tree planting ▪ Fund staff for community forestry ▪ Funding for tree inventory and support for the Forestry Division; ▪ Funding support for forest management on public lands;	¾ time staff person	DRP MO P&P WO CS	S O
Hold quarterly meetings with partners to share ideas and develop mutually supportive strategies.			O
Consider alternative modes of funding to augment Forestry Division budget ▪ Motor Vehicle Revenues ▪ Water and Waste Water Revenue ▪ USDA Forest Service ▪ US Environmental Protection Agency ▪ US Natural Resources Conservation Service ▪ US Army Corps of Engineers (flood hazard mitigation) ▪ FEMA ▪ MD Department of Natural Resources ▪ Bond bill			O

Appendices

Appendix A

Forest and Tree Inventories for Baltimore's Parks

Forest and Tree Inventories for Baltimore's Parks

Available from Myra Brosius, Baltimore City Forestry Division
410 433-6163 myra.brosius@baltimorecity.gov

- **Tree Inventory and Management Plan, Druid Hill Park, 1993**
  A model park inventory and management plan for park trees developed at the request of M. Brosius during the Druid Hill Park Master Plan by URI intern Ted Diers. Inventory and planting schedule developed for Druid Hill Park. Stands of trees were delineated in groups by Landscape type and species composition. Each stand was identified and planting recommendations made for planting to sustain the canopy long-term. Locations of stands described by landmarks. Appendix includes tree species list by dominance for total park.
  Large-scale map was drafted by M. Brosius with location of stands-- original of this map is located in the vault at 2600 Madison Avenue.

- **Entitation, Druid Hill Forest, 2006** Available from Anne Draddy, Department of Recreation and Parks

- **Druid Hill Park Forest Assessment, Maryland Forest Service, 1993**
  A forest assessment of naturalized forest developed at the request of M. Brosius during the Druid Hill Park Master Plan by Chris Stuhlinger and Becky Wilson, Maryland Forest Service. Foresters were asked to delineate dominant ground level species with attention to invasives and condition of understory regeneration. Includes data sheets of forest plots, understory, and ground level species. Small scale map of overstory associations and ground level conditions.

- **Druid Hill Park Land Cover Analysis, 1993** Large scale map of plant associations and ground-level dominant species informed by landuse history, developed by M. Brosius. Map delineates forests by composition and the following categories: Mature Forest over 100 years old, native understory; Mature Forest over 100 years old, disturbed understory, invasive species present; Mature Forest less than 100 years old; Young fores/forest regeneration area; Released lawn, grasses and forbes predominant; Managed (i.e. yearly mowed) Wildflower Meadow. Dominant species of groundlevel vegetation is mapped within associations. Map located in vault at 2600 Madison Avenue.

- **Druid Hill Park Master Plan, 1995**
  Generalized description of forest associations based on data listed above and interpretation of data infused with landscape history. Generalized forest management recommendations.

- **Various Maps and Species Sist for Historical and Contemporary Tree Locations and Species of Patterson Park**
  by M. Brosius for Patterson Park Master Plan
  --Historical Trend, trees in Patterson park table and graph, No. trees 1887, 1915, 1995.

--Ranking and percent of tree species by numbers present, 1887, 1915, 199Tree Inventory, species, condition, height and map by Jim Rose, volunteer, Columbia Maryland, 1997
--Map analysis on 1977 base map marked by the following category:
--Trees present 1977, still here; Trees present 1977, absent; New trees.
--Species list keyed to present 1887, 1915, Olmsted plan, today (1996).
--Historic trends for tree canopy were mapped and these maps may be in the vault at 2600. If interested in finding them contact M. Brosius at e-mail and phone listed above.
--Earthday Planting c.1996 Map of volunteer planting. Locations only near recreation center.

- **Cylburn Park**
  Various documents produced in 2001 while M. Brosius worked with the Cylburn Arboretum Association and Director of Horticulture to develop management goals for Cylburn Arboretum
  - *The Desired Future Forest of Cylburn Arboretum.* Statement composed at the request of Maryland Forest Service as a condition of performing a Forest Assessment.
  - Forest Stewardship Plan for City of Baltimore, Cylburn Arboretum by Christine Duce and Rob Northrop, Maryland Forest Service. Stands were delineated, mapped and assessed by dominant species composition or "forest cover types". Report includes soils, forest associations by species, size class distribution, amount and species of exotic invasive species by stand, vertical structure.

- **Carroll Park**
  - Census of Trees and shrubs of Carroll Park 1987. Performed as part of the National Park Service Master Plan for Carroll Park.
  - Carroll Park Vegetation Survey, 1996. This document updated the 1987 inventory and was performed by Calvin Buikema and Mary Porter.Map accompanies from 1987 survey.
  - Carroll Park Master Plan, 2000?. Existing conditions map shows field-updated locations of trees at that time. (major tornado destroyed trees after the 1996 servey and significant trees have been planted by the Friends of Carroll Park since the 2000 master plan.)

- **Leakin Park Forest Assessment** c. 1970's

Appendix B

Species composition of and estimated number of trees in Baltimore's urban forest

UFORE

Species Composition Of And Estimated Number Of Trees (Including Dead Trees) In Baltimore's Urban Forest

Species	Number of trees	Percent of population
White/green ash	293,400	10.3
Other species (primarily dead)	175,100	6.2
American elm	166,700	5.9
American beech	163,900	5.8
Black cherry	161,300	5.7
Black locust	155,000	5.5
Tree of heaven	146,200	5.2
White oak	103,100	3.6
Sassafras	95,100	3.4
Boxelder	93,100	3.3
White mulberry	89,400	3.2
Flowering dogwood	88,000	3.1
Northern red oak	85,000	3.0
Chinese elm	81,700	2.9
Silver maple	78,800	2.8
Red maple	73,800	2.6
Tulip tree	62,000	2.2
Eastern white pine	57,200	2.0
Mockernut hickory	41,700	1.5
Norway spruce	36,800	1.3
Slippery elm	33,500	1.2
American sycamore	32,900	1.2
Norway maple	32,700	1.2
Common pear	29,700	1.0
Willow oak	29,600	1.0
Cherry	26,100	0.9
Eastern red cedar	23,200	0.8
Black oak	22,800	0.8
Eastern hemlock	19,600	0.7
Sugar maple	18,100	0.6
Black tupelo	18,000	0.6
Alternate-leaf dogwood	17,000	0.6
Chestnut oak	14,600	0.5
Common juniper	14,500	0.5
Japanese maple	13,800	0.5
American hornbeam	13,300	0.5
Oriental arbor vitae	13,200	0.5
American holly	12,100	0.4
Black walnut	10,300	0.4
Pin oak	10,300	0.4
American basswood	9,600	0.3

Species	Number of trees	Percent of population
Eastern hophornbeam	9,200	0.3
Northern catalpa	8,900	0.3
Sweet cherry	8,300	0.3
Juniper	8,100	0.3
Honeylocust	6,900	0.2
Crabapple	6,900	0.2
Rhododendron	6,900	0.2
Eastern redbud	6,000	0.2
Witch hazel	6,000	0.2
Northern hackberry	5,800	0.2
Cucumber tree	5,200	0.2
Russian olive	4,900	0.2
Sawtooth oak	4,900	0.2
Pecan	4,600	0.2
Pumpkin ash	4,600	0.2
Japanese pieris	4,600	0.2
Red spruce	4,600	0.2
Northern white cedar	4,600	0.2
Bitternut hickory	4,000	0.1
Pignut hickory	4,000	0.1
Southern red oak	3,700	0.1
Littleleaf linden	3,700	0.1
Arrowwood	3,700	0.1
Dogwood	3,000	0.1
Ash	3,000	0.1
Spicebush	3,000	0.1
Sumac	3,000	0.1
Maple	2,900	0.1
Almond	2,900	0.1
Weeping willow	2,900	0.1
Cedar of lebanon	2,300	0.1
Atlantic white cedar	2,300	0.1
Rose-of-sharon	2,300	0.1
Eastern cottonwood	2,300	0.1
Nectarine	2,300	0.1
Sweetgum	2,000	0.1
Oak	2,000	0.1
Scarlet oak	2,000	0.1
American elder	1,500	0.1
Pawpaw	1,000	0.0
Nutmeg hickory	1,000	0.0
Total	2,835,500	100.0

Appendix C

Tree Care Instructions for Newly Planted Trees:

Door Hanger

This wonderful tree has been planted to provide shade, beautify our city, and help clean the air we breathe. Like all living things, trees need water, nutrients, and protection to stay healthy. Please care for your tree by following these important tips.

WATER YOUR TREE

From April through October water your tree twice a week with 10 gallons of water. Allow the water to slowly seep down through the soil to the roots. Dishwater, rinse water, or the water you let run to warm the shower can be recycled to water your tree.

MULCH YOUR TREE

Mulch your tree twice annually with 2-4" of wood chips, shredded bark, leaves, or grass clippings spread evenly around the base but not touching the tree trunk. Mulch helps retain moisture and enriches the soil. Never heap mulch against the base of a tree since soil on bark invites disease.

PROTECT YOUR TREE AND ITS ROOTS

Leave the stakes and ties on for one year to protect your tree and steady it during stormy weather. Weed around your tree and keep the base clear of trash, gas, oil, strong detergents, dog waste, and road salt. DO NOT build a planter box around the tree. This reduces the amount of water and nutrients available to the tree, reduces the tree's vigor or kills it outright. Never weed-whack or bang the base of a tree-- it is fragile and easily injured.

It is not unusual for a tree to lose its leaves during transplant so continue to water even if it turns brown. Allow three months for the tree to recover.

If you have any questions or concerns about the health of your tree, or for information about Baltimore City Trees, call the City Forestry Division at 410-396-6109 or go to our website at :

http://www.ci.baltimore.md.us/government/recnparks/forestry.htm

If you would like to volunteer to help green your neighborhood call the Office of Park Conservation and Community Forestry at 410-396-0339.

APPENDIX D

Asian Long Horned Beetle Host Species

Asian Longhorned Beetle

Host Species in Chicago & New York[61]

Highly preferred		
	Acer negundo	boxelder
	Acer plantanoindes	Norway maple
	Acer pseudoplatanus	sycamore maple
	Acer rubrum	red maple
	Acer saccharinum	silver maple
	Acer saccharum	sugar maple
	Aesculus hippocastanum	horsechestnut
	Salix spp.	willows
	Ulmus americana	American elm
Moderately preferred		
	Betula spp.	birches
	Populus spp.	poplars
Rarely attacked		
	Albizia julibrissin	mimosa or silktree
	Celtis occidentalis	hackberry
	Fraxinus pennsylvanica	green ash
	Fraxinus americana	white ash
	Platanus acerifolia	London plane
	Sorbus americana	mountain ash

[61] USDA Forest Service, Northeastern Area. http://www.na.fs.fed.us/fhp/alb/general/hostlist.sht

Appendix E

Tree Activities by Partners

Tree Activities by Partners

	Tree Planting ▪ *Public land*, ▪ Volunteer Labor	Tree Planting ▪ *Private land*, ▪ Volunteer Labor	Tree Planting ▪ Contractual	Tree Care ▪ Watering	Tree Care ▪ Mulching	Education ▪ Tree Stewardship	Education ▪ Exotic Invasives	Public Forest ▪ Assessment	Public Forest ▪ Invasive Removal	Reforestation	Data Gathering	Other
Alliance for the Chesapeake	X	X Schools				X	X		X			
Baltimore Forestry Div	X			X	X						X	X
Balto. City PCCO	X			X	X	X		X		X	X	X
Baltimore Forestry Bd	X											X
Bon Secours MD Clean & Green Program	X	X Vacants		X	X	X	X				X	X
Fells Prospect , Inc.												
Friends of Clifton Park	X				X	X	X		X	X	X	X
Friends of Patterson	X											
Friends of Carroll Park	X											
Herring Run WA.	X			X	X	X					X	X
Irvine Nature Center	X											
Jones Falls WA	X	X schools		X	X	X	X		X			X
Neighborhood Design Ctr.	X											
Parks & People Foundation	X	X Institution		X	X	X	X	X	X	X	X	X
Reservoir Hill I.Council	X	X Res&vacant		X	X	X	X	X	X		X	X
Treemendous Maryland	X	X schools								X		

Appendix F

Forestry Division Equipment Condition

FROM				
	Name & Title	**Rebecca Feldberg** City Arborist	RECREATIONand PARKS	
	Agency Name & Address	Department of Recreation and Parks / Forestry 2600 Madison Avenue Baltimore, MD 21217	MEMO	
	Subject	Equipment status	410-396-6109	

January 24, 2007

TO:

Connie Brown, Director
Baltimore City Recreation & Parks
3001 East Drive
Baltimore, MD 21217

The Forestry Division plays a vital role in ensuring the safety of the citizens of Baltimore through the ongoing care of the city's trees. To accomplish that task we require equipment that is unique to this field of work. Tree work is deemed one of the most dangerous professions to work in. It is essential that the employees that do this dangerous work have the safest equipment available to them. In reviewing what we have to work with currently, I find that much of our essential equipment is old and out of date. Much of our equipment breaks down often. This, of course, affects the efficiency of our operation. This memo will outline my biggest concerns.

The two most important trucks that we use in this division are our Aerial Lift Trucks and our Log Loaders. The employees operating this equipment receive specialized training to ensure everyone's safety. The industry standard for use such as ours is seven years. We currently have two aerial lift trucks that are 14 years old and three log loaders that are 12 years old.

In addition, we have two chipper trucks that are twenty years old and one that is eighteen years old. We have two brush chippers that are fourteen years old and one that is seventeen years old. We have one stump cutter that is twenty-one years old and one that is thirteen years old. This equipment is also essential to our operation.

We currently have three vehicles that have more than 100,000 miles on them. Two sedans that are used by our inspectors are both twelve years old. Our two four-wheel drive jeeps are both eleven years old. We would benefit from having the two sedans converted to pick up trucks so that they could do small jobs when they come across them during their inspections. Having two four-wheel drive vehicles is also essential to our operation.

As you are aware one of my goals was to fill all the vacancies in my division. I am on the way to completing that task and find that we do not have adequate equipment when the positions are filled. It is important that we add two more pick up trucks to our fleet for the two Forestry Specialists.

In summary I believe it is essential that we have equipment that is current and operational to provide for a safe environment and a successful operation. I look forward to your attention to these concerns.

c: Christopher Carroll
Robert Dallas
Richard Miller

Appendix G

Regulatory Components to a Comprehensive Urban Forestry Management

Recommended Regulatory Provisions and Their Current Status Within Baltimore City Code[62]

		Regulatory Provision Per International Society of Arboriculture
Public Trees	Basic Provisions	Title of regulation is consistent with and expresses goals of comprehensive urban forest management
		Findings related to canopy goal or sustainable urban forest
		Stated purpose and intent of establishing a sustainable forest
		Jurisdiction over regulating public trees: city arborist
		Policy statement regarding public trees
		Local Government disclaims liability from public trees
		Procedure whereby decisions of the city arborist can be appealed.
		Penalties for violating public tree ordinance
		Enforcement of public tree ordinance by city arborist
		Performance evaluation required of the success of ordinance.
		Administrative responsibilities of public tree program manager (i.e. city arborist)
		Establishment of and responsibilities of a tree advisory board for public trees.
		Prohibit negligent or intentional damage to trees and other plants growing in the public right of way, including chemical damage to roots.
		Provide for municipal review and approval of any activity that could be detrimental to public trees.
		Establish a "tree fund" for fees in lieu
		Establish criteria for how the tree fund will be used
		Establish policy for mitigation (not fees in lieu)
		Establish criteria for how mitigation is implemented.
	Provisions for specific goals	Establish a tree board or commission
		Specify cooperation between city arborist and other agencies
		Implementation of an Urban Forest Management Plan
		Set priorities for solving conflicts between trees and street improvements.
		Set forth any responsibilities for maintenance of trees, either public or private, assigned to property owners.
		Prohibit the practice of topping and/or other especially destructive maintenance practices in public trees.
		Permit required from City Arborist to ensure that street tree selection and placement conforms with municipal standards.

[62] Adapted from the International Society of Arboriculture, Tree Ordinance Guidelines cited as:

Swiecki, T. J.; Bernhardt, E. A. (2001). Guidelines for Developing and Evaluating Tree Ordinances.http://www.isa-arbor.com/publications/ordinance.aspx

	Regulatory Provision Per ISA
Development Projects—public and private	Planting Requirements
	Performance standards for tree planting
	Performance standards for maintenance during establishment period
	Designation of responsibility for planting and maintenance
	Protocol to ensure that planting complies with the comprehensive urban forest management plan or other standards
	A mechanism to provide for monitoring tree establishment
	Amount of canopy cover to be provided within a set period of years by land use or development type
	Enforcement of Tree planting compliance
	Require street tree planting on streets abutting development site in compliance with standards and required maintenance
	Fees in lieu to program that supports canopy goal
	Developer installed Street trees inspected first by City Arborist
	Shading standards for parking lots based on the amount of shade to be provided by trees after a set period of time, e.g. as 50% of pavement shaded in fifteen years. With methodology for determining requirements, maintenance and enforcement.
	Replacement schedule for existing trees on development site
	Conservation of forest and trees during development that disturbs more than 20,000 s.f.
	Conservation of forest and trees during development that disturbs less than 20,000 s.f.
	Establish standards for tree canopy retention during development and mitigation
	Incorporate differential tree retention standards for natives vs exotics and require removal of invasive exotics during development.
Private Trees	Define public health and safety nuisances that are related to trees which are subject to abatement by the local government, and provisions for abatement (e.g. large dead limbs hanging in ROW)
	Define nuisances that threaten trees which are subject to abatement by the local government, such as disease and invasive plants, and provisions for abatement
	Improve care of private trees by ensuring that firms performing tree maintenance are qualified and have appropriate liability insurance coverage.
	Protect designated individual trees (e.g. historic, landmark, or trees over certain size) on private property from indiscriminate removal and damage.

APPENDIX H
TreeBaltimore Community Grants Program—A Proposal

TreeBaltimore Community Grants Program—a proposal

- The TreeBaltimore Community grants program would promote the planting of shade trees on private property within view of the public streets in Baltimore City. Grants would be available to organizations such as Civic Associations, Home Owners Associations, apartment complexes, churches, and private schools who would be required to purchase a minimum number of trees at 50 percent of the retail cost. Trees would be encouraged, but not required, to be planted in front yards, side yards or on corner lots. Groups in areas needing trees the most would be targeted for outreach, however, the program would be available to all qualifying organizations.

- This program would start out with a budget of $20,000 a year with the goal of planting approximately 400 trees. Reimbursement would occur after the purchase of trees unless other arrangements are made with the Forestry Division. The Department of Recreation and Parks would coordinate, promote and administer the program. A board, such as the Forestry Board would be responsible for developing criteria for awarding the grants and Forestry administrative staff would keep records and statistics on the program.

- Civic Associations receiving the grant would be responsible for finding interested citizens in their association to participate. They would be responsible for collecting the necessary documentation for our records and confirming that the trees have actually been planted. Citizens would receive up to $50dollars towards a tree of their choice in a 15 gallon pot and would plant it themselves. A $50 dollar grant would provide about 50% of the cost of a tree caliper size of approximately 1-1 ½ “. In the case of apartment complexes, Home owners associations, churches or private schools with community space the management or home owners association would be responsible for purchasing and planting the trees, and providing necessary documentation for our records.

- The Forestry Division would provide information on recommended trees, choosing appropriate sites, proper planting and maintenance techniques, and nurseries in the area. We would also offer a training session for those interested in more hands on assistance. This session would include proper planting techniques, maintenance requirements, promotion of related programs such as the backyard wildlife habitat program, the tree steward and master gardener programs, proper planting locations, species recommendations, and a question and answer session. The Forestry Division would also be responsible for maintaining records and tracking the success of the program.

- Citizens would be required to sign a pledge and waiver of liability. The pledge would focus on care and protection of the tree. The waiver would state that the new tree would be owned by them and would be their responsibility. By asking for these documents we will also be able to obtain statistical information for our records. With this information we will be able to track the success of the program.

CITIZEN PLEDGE (DRAFT)

When I plant this tree (these trees) on my/our property, it becomes mine to enjoy and care for. By accepting and planting this tree, I pledge to:

1. Care for My Tree

- For the first two years, I will water my tree twice a week with 5 gallons of water between April and October
- I will mulch the ground around the roots of my tree with wood chips or compost (something I can create with grass clippings and leaves). Arrange mulch in a well (doughnut shape) around the root zone to absorb water and prevent weeds.
- Plant my tree in a location that will insure longevity.

2. Protect My Tree

- I do not plan to cut down my tree.
- I will keep grass from growing within 1 foot of the tree trunk
- I will keep lawnmowers and weed whackers from damaging the trunk

3. Ask for Help

- I can ask for advice about my tree by calling the Virginia Cooperative Extension office at 703-228-6414.

By _____

Name _____

Address _____

_____

DATE _____

Number of trees planted _____

Types of trees planted and how many of each?

TreeBaltimore Community Grants Program—a proposal (con'td)

WAIVER OF LIABILITY (DRAFT)

By purchasing a tree(s) under the TreeBaltimore Community Grants Program, I acknowledge that I have received a healthy, mature tree from a reputable nursery.

As an express condition of receiving this tree(s), I agree to hold harmless Arlington County, its elected officials, employees, or agents, or members of the Urban Forestry Commission for injury or damage to persons or property resulting from planting this tree.

I further agree to hold same harmless for any damage caused by such tree(s) associated with disease, or if said tree(s) in any way causes damage to property as a result of actions by me, or people acting on behalf, or for Acts of God that may result in damage to said tree(s) or other persons or property.

I hereby acknowledge that said tree(s) is now my personal property and I assume all responsibility for its care and upkeep.

By _____

Name _____

Address _____

_____

DATE _____